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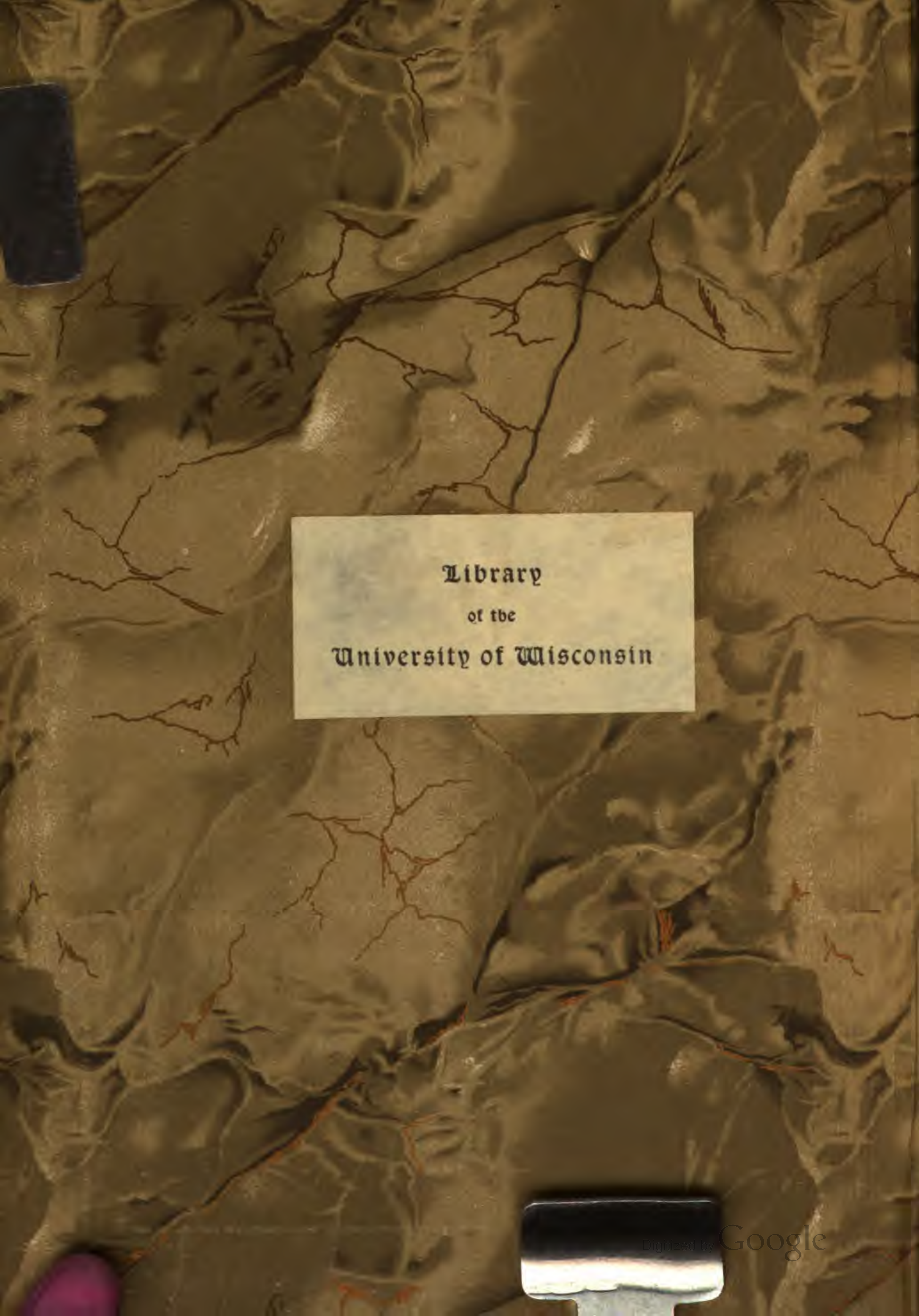

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KEY TO PRONUNCIATION.

ä	far, father
ā	fate, hate
a or ă	at, fat
ã	air, care
ạ	ado, sofa
â	all, fall
ch	choose, church
ē	eel, we
e or ĕ	bed, end
ė	her, over: also Fr. *e*, as in *de; eu*, as in *neuf;* and *oeu*, as in *boeuf, coeur;* Ger. *ö* (or *oe*), as in *ökonomie*.
ẹ	befall, elope
ẽ	agent, trident
ff	off, trough
g	gas, get
gw	anguish, guava
h	hat, hot
h or ʜ	Ger. *ch*, as in *nicht, wacht*
hw	what
ī	file, ice
i or ĭ	him, it
ï	between e and i, mostly in Oriental final syllables, as, Ferid-ud-din
j	gem, genius
kw	quaint, quite
ṅ	Fr. nasal *m* or *n*, as in *embonpoint, Jean, temps*
ñ	Span. *ñ*, as in ***cañon*** (căn'yŏn), ***piñon*** (pēn'yŏn)
ng	mingle, singing
nk	bank, ink
ō	no, open
o or ŏ	not, on
ô	corn, nor
ȯ	atom, symbol
ọ	book, look
oi	oil, soil; also Ger. ***eu***, as in ***beutel***
ö or oo	fool, rule
ou or ow	allow, bowsprit
s	satisfy, sauce
sh	show, sure
th	thick, thin
ŧh	father, thither
ū	mute, use
u or ŭ	but, us
u̇	pull, put
ü	between u and e, as in Fr. ***sur***, Ger. *Müller*
v	of, very
y	(consonantal) yes, young
z	pleasant, rose
zh	azure, pleasure

′ (prime), ″ (secondary) accents, to indicate syllabic stress

THE AMERICANA

Little Women, a popular story for children by Louisa M. Alcott (q.v.), published in 1868.

Lit'tlehales, George Washington, American hydrographic engineer: b. Schuylkill County, Pa., 14 Oct. 1860. He was graduated from the United States Naval Academy in 1883. He is an associate editor of the 'International Journal of Terrestrial Magnetism,' and has published, 'The Development of Great Circle Sailing'; 'The Methods and Results of the Survey of Lower California'; 'The Magnetic Dip or Inclination'; 'The Azimuths of Celestial Bodies'; and other works, all published by the United States Navy Department.

Lit'tlejohn, Abram Newkirk, American Protestant Episcopal bishop: b. Florida, Montgomery County, N. Y., 13 Dec. 1824; d. Williamstown, Mass., 3 Aug. 1901. He was graduated at Union College in 1845 and took orders in the Episcopal Church in 1850. He was rector of St. Paul's, New Haven, Conn., 1851–60, and of Holy Trinity Church, Brooklyn, N. Y., 1860–9. He was made bishop of Long Island in 1869, and from 1874 was in charge of American Episcopal churches on the continent of Europe. He wrote 'Philosophy of Religion'; 'The Christian Ministry'; etc.

Littlejohn, John Martin, American physiologist and osteopathist: b. Glasgow, Scotland, 1867. He was graduated from the University of Glasgow, afterward studied theology and was ordained in 1886. He was a tutor in Glasgow University, principal of Rosemont College 1890, of Amity College, Iowa, 1894–7, and has been president of the board of trustees of the American School of Osteopathy, Kirksville, Mo., from 1900, and professor there from 1897. He has published 'The Political Theory of the Schoolmen and Grotius' (1894); 'Text-Book on Physiology' (1898); 'Lectures on Psycho-Pathology' (1900).

Lit'tleton, or Lyttleton, Sir Thomas, English jurist: b. Frankley, Worcestershire, 1402; d. there 23 Aug. 1481. He was a student at the Inner Temple, sheriff in 1447, recorder of Coventry in 1450, and in 1453 was made sergeant-at-law. After holding several legal appointments he became justice of the common pleas in 1466. His treatise on 'Tenures,' with the well-known commentary by Sir Edward Coke, was long the standard authority on the English law of real property. It was written in legal French, and first published at London about 1480. There are many subsequent editions.

Littleton, N. H., town, in Grafton County, on the Ammonoosuc River, and on the Boston & Maine railroad. When it was first settled in 1770, it was called Apthrop. When it was incorporated, in 1784, the name was changed to Littleton. It is in a section of the State noted for its beautiful scenery and cool summer climate. The river furnishes considerable waterpower; and the town has several manufactories. Its chief manufactures are shoes, gloves, wagons and carriages, whetstones, bobbins, stereoscopic views, wooden ware, and furniture. It has a good public library; the building is a gift from Andrew Carnegie. The government of the town is administered by means of the annual town meeting. Pop. (1910) 4,069.

Littoral Deposits. See SANDSTONE.

Littré, Maximilien Paul Emile, mäk-sĭ-mĭl-ĭ-ŏṅ pōl ā-mēl lē-trā, French philosopher: b. Paris 1 Feb. 1801; d. there 2 June 1881. After completing his course at school his study of medicine was interrupted by the death of his father. He then engaged in teaching for a livelihood, took an active part in the revolution of 1830, and soon after was invited by Armand Carrel, editor of the 'National,' to write for that paper. In 1839 he published the first volume of an edition of Hippocrates in the original, with a French translation and copious notes. This work, in 10 volumes, secured his admission to the Académie des Inscriptions et Belles-Lettres. He translated Strauss's 'Leben Jesu,' and having adopted Comtist principles, wrote an able and lucid synopsis of them in his 'De la Philosophie Positive' (1845). In 1854 he was appointed editor of the 'Journal dis Savants' and in 1863 commenced the publication of his great work, the 'Dictionnaire de la Langue française,' which has been called the best dictionary of any living language yet published. This was finished in 1873, two years previous to which Littré had been admitted into the Académie Française. Another important work of his was an edition of Pliny's 'Natural History' with a translation and notes. During the siege of Paris he retired with his family to Bordeaux, and was appointed professor of history and geography in the polytechnic school there. He was afterward summoned to Versailles to take his seat in the senate, having been chosen by the department of the Seine. He became a life Senator in 1874. Among Littré's other works are 'Application de la Philosophie Positive au Gouvernement des Sociétés' (1849); 'Conservation, Révolution et Positivisme' (1852); 'Paroles de Philosophie Positive' (1859); 'Historie de la Langue française' (1862); 'Auguste Comte et la Philosophie Positive' (1863); 'Etudes sur les Barbares et le Moyen Age' (1867); 'Médecine et Médecins' (1871); and 'Littérature et Histoire' (1875).

Lit'trow, Joseph Johann von, Austrian astronomer: b. Bischof-Teinitz, Bohemia, 13 March 1781; d. Vienna 30 Nov. 1840. In 1807 he obtained the chair of astronomy in the University of Cracow, and in 1810 accepted a similar chair in Kasan, where he founded the observatory. He became in 1816 joint director of the observatory of Buda, and from this he removed in 1819 to become director of the observatory of Vienna. He completely reorganized this establishment, and in his lectures yearly attracted a numerous audience, not only of ordinary students, but of unprofessional persons, many of them strangers from abroad. His writings, chiefly on mathematical and astronomical subjects, are numerous, and have generally had a very extensive circulation. By far the most popular of all is his 'Die Wunder des Himmels,' of which the 8th edition was published (1895–7). It ranks as one of the best works of astronomy for the use of general readers.

Littrow, Karl von, Austrian astronomer: b. Kasan, Russia, 18 July 1811; d. Venice 16 Nov 1877. He was a son of Johann Littrow (q.v.), whom he assisted in the Vienna Observatory from 1831, and succeeding him as director in 1842. He edited the works of his father, adding considerably to 'Die Wunder des Himmels,' and was the author of 'Populäre Geometrie' (1839); 'Verzeichnis der geographischen Ortsbestimmungen' (1844–6).

Liturgy (Greek λειτουργία means a public service; used at Athens to mean a public service which the richer citizens discharged at their own expense). The Septuagint translators used the Greek word *leitourgos* for that service of God in the Sanctuary. In the Hebrew it had various kindred meanings; in the Old Testament it usually denotes the service of a Jewish priest, but in the New Testament it is used of any service rendered to God. In the 4th century, the word as applied to priestly ministrations was generally recognized; and while it continued in use as meaning any solemn service, it was applied especially to the Eucharistic service. It is in this sense that the word is used by the Greek Church when they say «Divine liturgy.»

The records extant which show the exact liturgy of the Christian Church in the 1st century are more the allusions found in documents of the 2d century. From the year 150 there are numerous proofs to show the existence of a fixed order and fixed words for the service of the mass or for the Eucharistic service. This service or liturgy was not made just when mentioned by Cyprian, and in 138 by Justin, and many others who committed to writing the order of the services or the liturgy. But there is not sufficient proof to warrant the assertion that there was any entire written liturgy before the 4th century. As the liturgies exist to-day they may be divided into five groups or families of liturgies, distinguished from each other chiefly, though not entirely, by the different arrangement of their parts. Three of the groups are Oriental and two are Western. They are: (1) The West Syrian Group, which includes the Liturgies of Saint James, Saint Basil, Saint Chrysostom, and that of Armenia. In this group the intercession for the living and the dead is placed after the invocation of the Holy Spirit, which in Oriental liturgies follows the consecration.

(2) The Alexandrian Group, which includes three Greek liturgies; Saint Mark, Saint Basil, and Saint Gregory, also the Coptic liturgies. This group is characterized by the «Great Intercession» for the living and the dead being placed in the midst of the Preface.

(3) The East Syrian Group includes the liturgies in the Syriac language as used by those who belong to the Roman Catholic Church. In this group the «general intercession» is placed between the words of institution and the invocation of the Holy Spirit.

(4) The Liturgies of Gaul and Spain. In this group the «Great Intercession» comes just after the offertory, though the Mozarabic liturgy has a memento of the living before the Pater Noster.

(5) Gallican Liturgy. In this the intercession is divided, that of the living is before consecration, and that of the dead after consecration.

That part of the «Liturgy of the Mass» called the «Canon» is very ancient, and existed about as at present since the time of the Apostles (see MASS; MISSAL). The liturgy of the Church of England is derived from the Ephesine original through the ancient Gallican liturgy which was brought to France by Greek missionaries, who were accustomed to use the form known as the liturgy of Saint John. There is no invocation of the Holy Spirit in the present English form, although the Protestant Episcopal Church has restored the invocation, like the Scottish Episcopal Church. There is, however, no ritual element wanting in these two English forms whether they be compared with the Greek or Latin liturgies. The liturgy in use in the Protestant Episcopal Church more nearly resembles the Gallican liturgy than any other group, but in some respects there is a difference in arrangement, and also in meaning. There is no intercession for the dead, and the intercession for the living comes before the Communion.

Bibliography.—Tertullian, 'De Corona'; Cyprian, 'Epistle'; Report of Council in Trullo; Probst, 'Liturgie der drei ersten Jahrhunderte,' who claims that there was a written liturgy before 150; Hammond, 'Ancient Liturgies'; Smith and Cheetum, 'Liturgies'; Rock, 'The Church of Our Fathers, as Seen in Saint Osmond's Rite for the Cathedral of Salisbury' (1904); De Herdt, 'Sacra Liturgia' (3 vols.).

Lit'uus, (1) a crooked staff, represented in works of art as borne by the ancient Roman augurs in their divinations. It was like a crozier in shape. (2) A trumpet, having a mouth which curved upward, and which was used by the Roman priests and cavalry. (3) In geometry, a spiral, of which the characteristic property is that the square of any two radii vectores are reciprocally proportional to the angles which they respectively make with a certain line given in position, and which is an asymptote to the spiral.

Liudger, lĭ-ood'ger, **Saint,** the first bishop of Münster, Germany: b. Friesland about 744; d. Billerbeck 26 March 809. He studied in England under Alcuin, and returned to preach Christianity to his countrymen. When Wittekind was sent to Friesland in 784, Liudger abandoned his mission and went to Rome. Subsequently he returned to become the first bishop of Münster. The various *Vitæ S. Liudigeri* are collected in the 'Geschichtsquellen des Bistums Münster' (Diekamp 1881). Consult also the Lives by Hüsing (1878); Pingsmann (1879); and Krimphove (1886).

Liudprand, lĭ-ood'prănd, **Liutprand,** or **Liuzo,** Italian historian: b. about 922; d. 972. He was of a noble Lombard lineage. His father, who was King Hugo's ambassador to Constantinople, dying when the son was not more than five years old, young Liudprand was educated as a page in King Hugo's court in Pavia, and later entered the Church. Hugo's successor, Berengarius, made him chancellor, and in 949 sent him on an important diplomatic mission to Constantinople. Soon afterward he joined himself to the Emperor Otho I., who, in 962, made him bishop of Cremona, and in 968 sent him on an important but unsuccessful mission to the court of the Eastern Church, which called forth his bitter ‘De Legatione Constantinopolitana.’ His ‘Antapodosis’ covering the period from 886–950. and ‘De Rebus Gestis Ottonis Magni imperatoris,’ from 960 to 964, are important sources of 10th century history. They are all found in the ‘Monumenta Germaniæ Historica.’

Liu-kiu, lē-oo'kē-oo', or **Loo-choo Islands**, Japan, a chain of 37 islands, mostly small, forming an integral part of the empire, and extending irregularly in a southwestern direction between Kiu-shiu and Formosa. The islands were conquered by the Prince of Satsuma in 1609. They constitute the Japanese prefecture of Okinawa, with an area of 1,863 square miles; pop. 160,000. Oshima and Okinawa are the only islands of considerable size. Capital, Shiuri in Okinawa. See Japan.

Liu-Kun-Yi, Chinese statesman: b. Hunan about 1820; d. Nanking 6 Oct. 1902. He received a military education, and though not a scholar held high official positions. In 1861 he commanded one of the armies raised to oppose the Taiping rebels, and defeated them by a series of successful maneuvers. At the time of the Boxer outbreak he was viceroy of Nanking, the so-called «southern capital» of China, and in spite of the vigorous anti-foreign agitation in his own province and the hostile attitude of the Imperial Government at Peking, he refused to join the anti-foreign movement, and used his foreign-drilled troops to suppress all Boxer demonstrations. In this he was supported by the viceroy of Wuchang, and these two viceroys prevented the spread of the Boxer movement to the valley of the Yang-tse-Kiang, and were consequently influential in protecting Chinese interests in the subsequent peace negotiations.

Liutprand, Italian historian. See Liudprand.

Liutprant, lĭ-oot'prănt, or **Liutprand**, king of the Lombards (q.v.) from 712 to 744, the period of their greatest power: b. about 688. He was an active and popular prince. He captured Ravenna in 728, defeated the dukes of Spoleto and Beneventum in 741, joined with Charles Martel against the Arabs, and extended the Lombard sway over practically the whole of Italy. His death marked the beginning of the downfall of the kingdom. His laws are codified in the ‘Edicta Liutprandi.’

Livadia, lĭv-ä-dē'ä, or **Lebadea**, Greece, a town on the Hercyna, 52 miles northwest of Athens. It is defended by a castle; and has manufactures of cotton goods, and a trade in small articles of raw produce. Pop. 6,500. Higher up the river, in a narrow gorge, is the site of the ancient Hieron, or cave of Trophonius, and the fountains of Lethe and Mnemosyne.

Livadia, a Russian imperial residence near Yalta, on the southern coast of the Crimea, Russia. It is an extensive and beautiful estate, with two fine palaces and many less important villas and lodges. It was the favorite residence of Alexander III., who died there 1 Nov. 1894.

Live-for-ever, or Garden Orpine, a small cultivated stonecrop, *Sedum telephium*. See Stonecrop.

Liveing, George Downing, English chemist and surgeon: b. Nayland, Suffolk, 21 Dec. 1827. He was graduated at St. John's College, Cambridge, in 1850, and in 1853 he became a fellow and lecturer in natural science in that college. He was appointed professor of chemistry at the Royal Military College, Sandhurst, in 1860; and in 1861 professor of chemistry in the University of Cambridge. In 1852 he established at his own expense the first chemical laboratory for undergraduates in Cambridge, and may be said to be the founder of the system of experimental teaching that is now such a prominent feature of that university. He was instrumental in securing the examination and inspection by the university of secondary schools, and the admission of girls' schools to the examinations. He also took an active part in the establishment in 1873 of the Oxford and Cambridge Schools Examination Board, and in 1875 of the medical examinations for the Diploma of Public Health. He promoted the establishment of the School of Agricultural Science at Cambridge. He has published: ‘On the Transmutation of Matter’ (Cambridge Essays, 1st series, 1855); ‘Ultra-Violet Spectra of the Elements’ (with Prof. Dewar, ‘Transactions’ of the Royal Society, 1883); ‘Chemical Equilibrium the Result of the Dissipation of Energy’ (1885); ‘Report on the University Colleges’ (with Mr. Warren, 1897); and many papers on spectroscopy, crystallization, etc., in the ‘Proceedings’ of the Royal Society, the ‘Proceedings’ of the Cambridge Philosophical Society, and the ‘Philosophical Magazine.’

Live Oak, a species of evergreen oak found growing in various parts of the United States, Central America, and Cuba. See Oak.

Live Stock, American. The animals which emigrants brought from Europe and the British Isles gave America a mixed aggregation of traits and types, from which came our native cattle, our wild horses, and the common hog and sheep. From these the pioneers bred; their descendants, in turn, improving these breeds by importation and selection, aided by a temperate climate, fertile soil, rich herbage and grasses and grains such as no other country had ever furnished for the foundation and development of domestic animals. The result has been to give to the United States in one century the highest type and greatest number of high-grade and pure-bred animals of any nation on the earth.

From 4,336,719 in 1850 the number of horses in the Union had increased to 21,203,901 in 1900, a ratio of more than one horse to every family. The imports of horses into the United States, from 45,610, valued at $3,726,534 in 1884, had decreased to 3,785, valued at $985,738 in 1901, while the export of horses in 1884, 2,721, valued at $424,317, had increased in 1901 to 99,809, valued at $10,037,204. The majority of the imported horses are for breeding purposes. During the last quarter of the 19th century the rapid increase of the lower grade of horses from the ranches of the West and Southwest had lowered the price of farm and common draft or street horses, and the market was further depreciated by the rapid displacement of horses in street car service by the various electric street railroad systems. New avenues for disposal of the surplus had to be opened, and as even the price of cured horse meat for shipment to Belgium and Germany fell as low as six cents per pound, many thousands of inferior animals, unemployed and disabled horses, found their way to fertilizer factories. These factories buy cast-off horses as low as $2 per head; the hide is worth, on an average, $3.25, the bones $1.25, the fat and tankage about as much more; and with the resultant fertilizer yields handsome profits. The result of the wholesale destruction and diminution of these inferior animals has been a rapid improvement, still progressing, in the quality of the American horse. See various articles under title HORSE for information regarding that animal.

In the west and south the mule, as a draft and farm animal, has long been of great service. Gen. Washington was America's first successful breeder of mules. The king of Spain presented Washington with a jack from his royal stud in 1787. Gen. Lafayette also presented him with one, which sired Washington's favorite jack, Compound. To him he bred his best coach mares, and produced such valuable animals that the southern planters began to use their thoroughbred mares for raising mules. The mule being more steady at a draft, less liable to injury or disease, less subject to lameness, and being able to endue heat and hardship better than the horse, his price for heavy work has kept as high as that of draft horses. The number of mules in the United States increased from 3,438,523 in 1900 to 4,123,000 in 1910. There is no import trade in mules, the trade being wholly domestic and export. From 1,965, valued at $238,591, were exported in 1891; in 1900, 50,179, valued at $4,757,892; in 1910, 4,512, valued at $614,094. The large exports of horses and mules in 1900-1901 was in great part due to the demand for war purposes in South Africa. In 1902 the export of horses was 60,694, value $6,086,012; in 1910, 28,910, valued at $4,081,157.

In American cattle, not only good health but good blood is remarkable; the immense herds have been singularly free from the diseases which from time to time have swept off the cattle of middle and southern Europe. Pleuro-pneumonia and anthrax entered our shores with imported cattle from lands where such diseases have a hold, but these plagues spread over no great extent of country. Under the efficient organization of the U. S. Bureau of Animal Industry, outbreaks of any contagion speedily disappeared; and every cargo of cattle leaving our ports carries with it a clean bill of health. Fresh importations are continually being made, and in our herds is the blood of the choicest of the Devon, the shorthorn, the longhorn, the Hereford, the Sussex, and the Norfolk of England; the Ayrshires, Angus, and Galloway of Scotland; the Kerrys of Ireland; the Alderney, Guernsey, and Jersey of the Channel Islands, and the Holstein from Holland.

The first English colonial settlement on the James River, brought cattle from England as early as 1607. Succeeding colonies brought cattle from the countries whence they emigrated. In 1625 the settlers of New York made an importation from Holland, which was followed by further importations, each leaving its impress on the cattle of that region. The English colonies in Massachusetts and New Hampshire, the Dutch in New Jersey, the Swedes in Delaware, and the Danes on the Piscataqua River, all brought cattle from the countries nearest the ports from which they sailed. The cattle of Normandy came in with the French around Quebec, and the Spanish cattle from South America and Mexico made their impress on the Southwest, as seen in what are now called Texas cattle. The shorthorns have been more used, perhaps, than any other beef breed for improvement of stock; and the early settlers were more interested in developing cattle that could concentrate the wealth of grass and corn of the fertile valleys into beef than into butter and cheese.

Soon after the Revolutionary War a few shorthorn cattle had been imported into Virginia. They were well fleshed, and the cows gave as much as 32 quarts of milk a day. In 1783, Matthew Patton, Sr., of the South Fork of the Potomac, imported a longhorn bull. In 1785 three of Patton's sons moved to Kentucky, taking with them some of the half-bred heifers. In 1795 they sent back to Virginia and Maryland for cattle known as «milk cattle.» In 1803 the Pattons brought out the «milk bull» Pluto 825, a noted breeder. Descendants of this bull and another named Mars, and a cow, Venus, found their way into the Virginia Reservation of Ohio, and laid the foundation for future improvement of cattle in the West. In 1817, Lewis Sanders, of Lexington, Ky., imported three bulls and three heifers from England, which were of so good a quality that they laid the foundation of many excellent herds. In 1818, Cornelius Coolidge, of Boston, Mass., imported a heifer and a bull. About 1820 several public-spirited men in the neighborhood of Boston brought out at different times a number of valuable animals, whose descendants are still numerous in New England. In 1823, General Stephen Van Rensselaer, of Albany, N. Y., imported the bull Washington and two heifers. In 1824, Colonel John Hare Powell, of Philadelphia, began to import shorthorns, and bred largely at his estate near the city, selling them to go into Ohio and Kentucky. The first drove of fat cattle from the fertile Scioto country and the Virginia Reservation crossed the Alleghanies in the spring of 1805. Of the 68 head, 22 were disposed of at Morefield, Va. The remainder were driven on to Baltimore where they were sold at a net profit of $31.77 per head. The problem of getting cattle from the grazing lands of the West to the Eastern markets was solved, and its effects were as great as those of the successful shipment later of the first cargo of fat cattle to England, or the first efforts of Swift & Company, in sending dressed beef from Chicago to New England. The Virginians of Ohio and Kentucky co-operated in the exchange and improvement of their best cattle. Not content with the slow improvement of cattle, various Ohio breeders under the lead of ex-Governor Duncan McArthur, Felix Renick, George Renick, William Renick, and S. S. Denney, resolved «to try the experiment of direct importation from Great Britain,» and formed a company 2 November 1833, with ample capital and unlimited public spirit, as no subscriber expected any profit on the money invested. Mr. Felix Renick, E. J. Harness, and Josiah Renick were sent to England to buy the best cattle they could find, regardless of price. Their first importation consisted of seven bulls and twelve cows and heifers. Further importations followed. In 1835 and 1836 Felix Renick had

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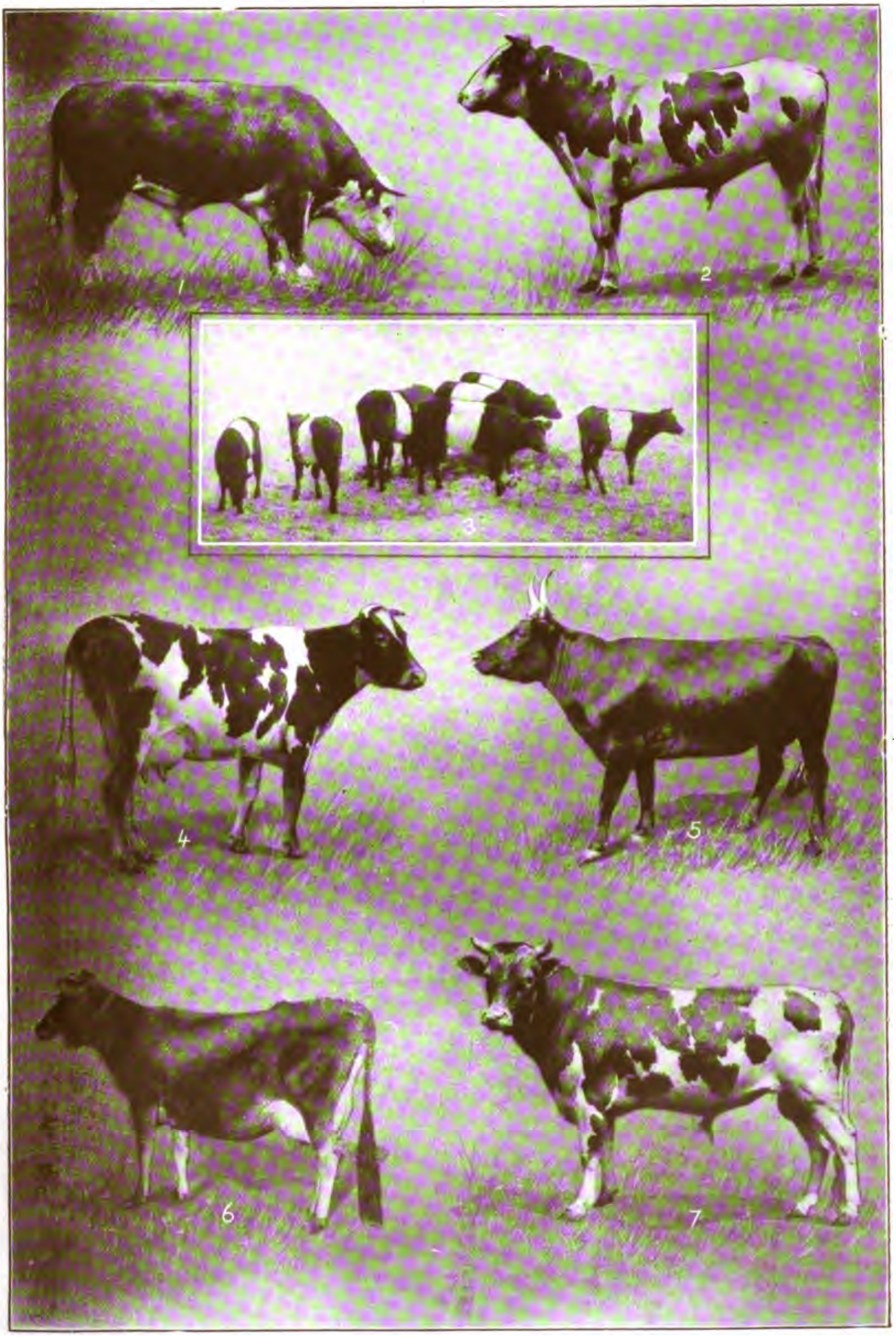

1. Hereford.
2. Holstein.
3. Group of Dutch-belted Calves.
4. Guernsey.
5. Devon.
6. Jersey.
7. Guernsey.

charge of the company's business and the breeding of the cattle, continuing up to the closing sale in 1837, when those remaining were sold at prices ranging from $425 to $2,500. Other companies were afterward formed in Kentucky and Ohio. The success of this pioneer company led also to heavier importations by the Eastern men; and Mr. Whitaker, an English breeder, sent 100 head to Philadelphia, which were sold on the farm of Mr. Powell, an extensive breeder and importer. During the 30's and later the Devons and Herefords had stanch admirers. Henry Clay had gone to England and imported Devons, Herefords, and shorthorns, and in a letter to Governor Trimble he advised the Ohio company to bring out Devons and Herefords, as they were "better for the yoke." The Devons were at that time the favorites in New England. The Herefords have been vastly improved in the prairie States, and have been used in great numbers on the plains, to the vast improvement of the range cattle of the West. As beef-cattle they have carried off a full share of prizes with the shorthorns at the Chicago fat-stock shows. As the farms of the country became improved, and cattle no longer wintered in the forests or open fields, farmers found horns to be an expensive and unnecessary appendage, and a constant menace to the quiet and peace of the herd enclosed in yards and sheds. The shipper, too, finds the horns a source of loss in the pens and the cars of the railroads. Buyers of feeding cattle prefer those without horns, since they can accommodate a greater number with peace and quiet at the feeding racks and troughs. These causes have led to the practice of dehorning cattle intended for the dairy and feed lots. The polled breeds of Scotland and England have been imported extensively within the last decade; and the polled Durham, a new breed of cattle originated in the Miami Valley is so far established that already the number of breeders and their favorites are numerous, and the type so well fixed that the first volume of the 'American Polled Durham Herd-Book' has been issued. At present there are successful herds of polled Durhams in Ohio, Indiana, Illinois, and Iowa. The long-horned Texas cattle are one remove above the buffalo. They doubtless are of Spanish origin, introduced into Mexico, of which Texas was then a part, about the year 1500. They overran the plains of the Southwest, and were for years killed for their hides and tallow. Before the advent of railroads into the Southwest, Texas was supposed to have one seventh as many cattle as all the other States and Territories. Until Kansas became settled, they were driven by trails into the Northwest, and made the base for founding the numerous and extensive cattle ranches which utilized the wild grasses of government lands. The settlers pushed west to take up lands along the water-courses of the mountain ranges until the boom in the cattle business burst, leaving wrecked fortunes and a clearer field for the legitimate production and improvement of cattle on the farms.

The necessity of greater attention to live stock and of plowing less and grazing more, is beginning to be recognized by the more intelligent, and, during the last quarter of the 19th century especial attention was paid to the improvement of dairy cattle. The importation of Channel Islands cattle and Holstein-Friesian was large, and even the dairy qualities of shorthorns attracted attention. The World's Fair dairy test of shorthorns, Jersey, Guernsey, and Ayrshire cattle continuing through several months, gave a new impulse to the breeding of Channel Islands cattle and dairy shorthorns. The Jersey, Holstein, and Ayrshire can be found in every community, and our milk records and dairy tests show that our improved cattle and our methods of breeding and feeding enable us to excel records made in the countries where dairy breeds originated. Our experiment stations and agricultural colleges are investing in dairy plants and employing every means known to science for the fostering and development of the dairy interests of the people.

Our foreign trade in dairy products is older than the government. During part of the first half of the 19th century our shipments of butter exceeded those of cheese. This continued until about 1842, when the introduction of cheese factories led to increased exports of that product. Instead of our American cheese growing in favor abroad, it deservedly lost standing, because of the process of "filling cheese" with lard, unmerchantable butter, etc. The history of the dairy business in America is one of vast fluctuations. The legitimate manufacturer has had to cope with the most ingenious substitutes. The fats of swine and cattle have come into competition with butter fat, by the introduction of oleomargarine, lard, neutral, and filled cheese. The business has been demoralized, and the reputation of American butter and cheese impaired. There is no longer any mystery about the character of oleo and filled cheese. Some States have regulated their sale by law, compelling them to be sold on their merits. The change in the values of butter and cheese for the last 40 years has been steadily downward.

As our dairy exports have declined with the quality of goods offered, our exports of beef-cattle have increased, the quality of stock being improved in the same ratio. One of the first attempts to export cattle from the Southwest was made by a company of ranchmen of Texas. It was before the days of refrigerator-cars and cold storage in vessels. Only 15 per cent of a large cargo of the Texas longhorns reached Liverpool. The first cattle exported for beef went to Glasgow about 1868. Only two consignments a week were first sent out. The number increased to 50 a week, but as the cost of export was $48.66 per head, shipments were discontinued in 1874. Freights declining to $10 or less per steer, the business was resumed, and has gradually increased as the prejudice against American beef gave way to enthusiasm in its favor. Since the first trials the business of exporting beeves, either alive or dressed, has grown to mammoth proportions. The effect of the transfer of the choicest beeves to a foreign market has been to stimulate the price of prime cattle. Illinois, Kentucky, and Ohio for years furnished the bulk of export cattle, but now Iowa and Missouri also send many. There was but a small surplus of cattle in this country prior to 1850. About that time grass-fed beeves began to find market in Cuba. The real commencement of our export business was in 1877, when the improvement started in Ohio and Kentucky, and worked westward, where cows and grass were abundant and cheap. In 1877

50,000 head were exported to Great Britain, Cuba, the British West Indies, Canada, and Mexico. More than half of this number went to Cuba, and only 5,091 to Great Britain. The quality of cattle having improved, the export trade to Great Britain in 18 years increased to 355,852, worth nearly $32,500,000. France, Germany, Belgium, and the Netherlands, took less than $2,000,000. From 394,772 heads of cattle valued at $36,576,412 exported in 1896, the number increased in 1901 to 454,590 heads, valued at $36,606,204. In 1910, 139,430 heads of cattle, valued at $12,200,154, were exported. 195,938 cattle were imported, some being high class stock for breeding purposes, and the greater number being "feeders," a cheap grade of animal, brought in from Mexico and Canada to be fattened for market. In 1877 the first shipments of fresh beef in refrigerator-ships were made. In 1870 the value of all shipments of beeves and beef products was $6,194,626. In 1902 the total value was $62,420,732, taking more than 1,000,000 of the choicest cattle; in 1910 it had decreased to $26,397,673. In 1870 an export beef was worth $15.98; in 1891 the average price was $81.26 each, showing that as quality improves price advances, although in 1901 it had fallen to an average price of $74.30. There is no longer any demand for good cattle among country butchers, and the farmer who formerly could fatten one to six prime bullocks has now no market.

The hog crop of America is most closely related to the corn crop. The States in the corn belt west of the Ohio River furnish the surplus pork for export and for home consumption in States where corn is not largely grown. Hogs were brought by the Virginia and Massachusetts settlers, and in the common hog of the country was early found a mixture of types and races from every country where pork was produced. This mongrel was the base, easily impressed by the blood of the China, Neapolitan, Berkshire, Tamworth, and other breeds, known as early as the second quarter of the century. After the settlement of Ohio and Kentucky improvement was marked. The corn in the valleys and the mast in the timber furnished food in such abundance that the energies of the early settlers were bent upon producing pork and cattle to utilize the superabundance. The West Indies furnished a market for all surplus pork of the Eastern States, and under the stimulus of this trade fat hogs were produced along the Delaware, before the development of the interest in the country around Cincinnati. The production of hogs in Ohio, Kentucky, and eastern Indiana increased so rapidly that Cincinnati early became the packing centre of the West. As the Wabash, the Illinois, and the Missouri valleys and the prairies became vast corn-fields, and the railroad pushed westward, the centre of pork production also moved west. Ohio is no longer the leading corn and hog State, being now the seventh; and Cincinnati is excelled as a packing city by Chicago, Kansas City, Omaha, St. Louis, and Indianapolis. The China and Berkshire, along with the Russian and Irish grazer, were earliest used to cross upon the common hog. In New Jersey the red hog formed the foundation for the large hogs to furnish the heavy meat for the West Indies and the Carolinas. In Chester County, Pennsylvania, the white hog was the favorite, and the type called Chester white was established. In the Miami Valley the China, Berkshire, Woburn, Russian, and Irish grazer blood mingled with that of the common hog, and the Poland China breed was evolved and improved to meet the wants of the packer and feeder. In northern Ohio, in the dairy districts, where the conditions of feed, soil, and handling were very different, the white hog of Pennsylvania has been improved, and we find a breed known as Todd's improved Chester whites. The red hog of New Jersey has come west, filled out, and is taking on the plumpness and refinement of bone, ear, and head peculiar to the breeds in a corn-growing country. In northern Indiana we find a breed of white hogs called Victorias, finer in type than the Chester whites, and of more growth than the small English breeds. The above-named American breeds have become so well fixed and established that each has its record. The improvement of the swine of America has been greater than that of its horses, cattle, or sheep, and with a far smaller outlay for imported animals for breeding purposes. The cotton States consume more pork than they produce, and the States producing the surplus are Iowa, Illinois, Ohio, Missouri, Indiana, Kansas, Nebraska, Wisconsin, Tennessee, Kentucky, Minnesota, and Michigan, ranking about in the order named. It has been estimated that 95 per cent of the exports of pork, 86 per cent of the exports of lard, and 93 per cent of the total exports of hog products from the United States come from the surplus of these States.

While the sheep industry is of variable importance, there are according to recent returns about 40,000,000 sheep in the United States, exclusive of lambs under one year of age. The chief sheep raising States are Montana, New Mexico, Wyoming, Ohio and Utah. The imports of sheep in 1910 were 126,152, valued at $696,879; the exports 44,517, valued at $209,000.

Our unequaled system of transportation is one of the prominent factors which helped the remarkable development of the pork business. Pork products are carried from Chicago or St. Louis to New York for only about one third of a cent per pound. The ocean charge from New York to Bremen is about the same. Direct consignments from St. Louis or Chicago to Bremen have been shipped for a little more than half a cent per pound. Lard production has suffered somewhat since the discovery of the process of utilizing a waste product of cotton. Cotton-seed oil has now come into such extensive use as a substitute for lard and lard-oil, for culinary and manufacturing purposes, that its present annual sale is estimated to exceed the equivalent of 70,000,000 pounds of lard. The production of oleo from beef suet has also furnished the by-product of stearine, which enters largely into the manufacture of lard substitutes, to give body and consistency to imitation lard. This adulteration of lard has brought American lard into disrepute in foreign markets, and reduced the demand. The surplus of pure lard continues great, and its extent fixes the price. The healthfulness of American pork, like that of our beef, has been a distinguishing

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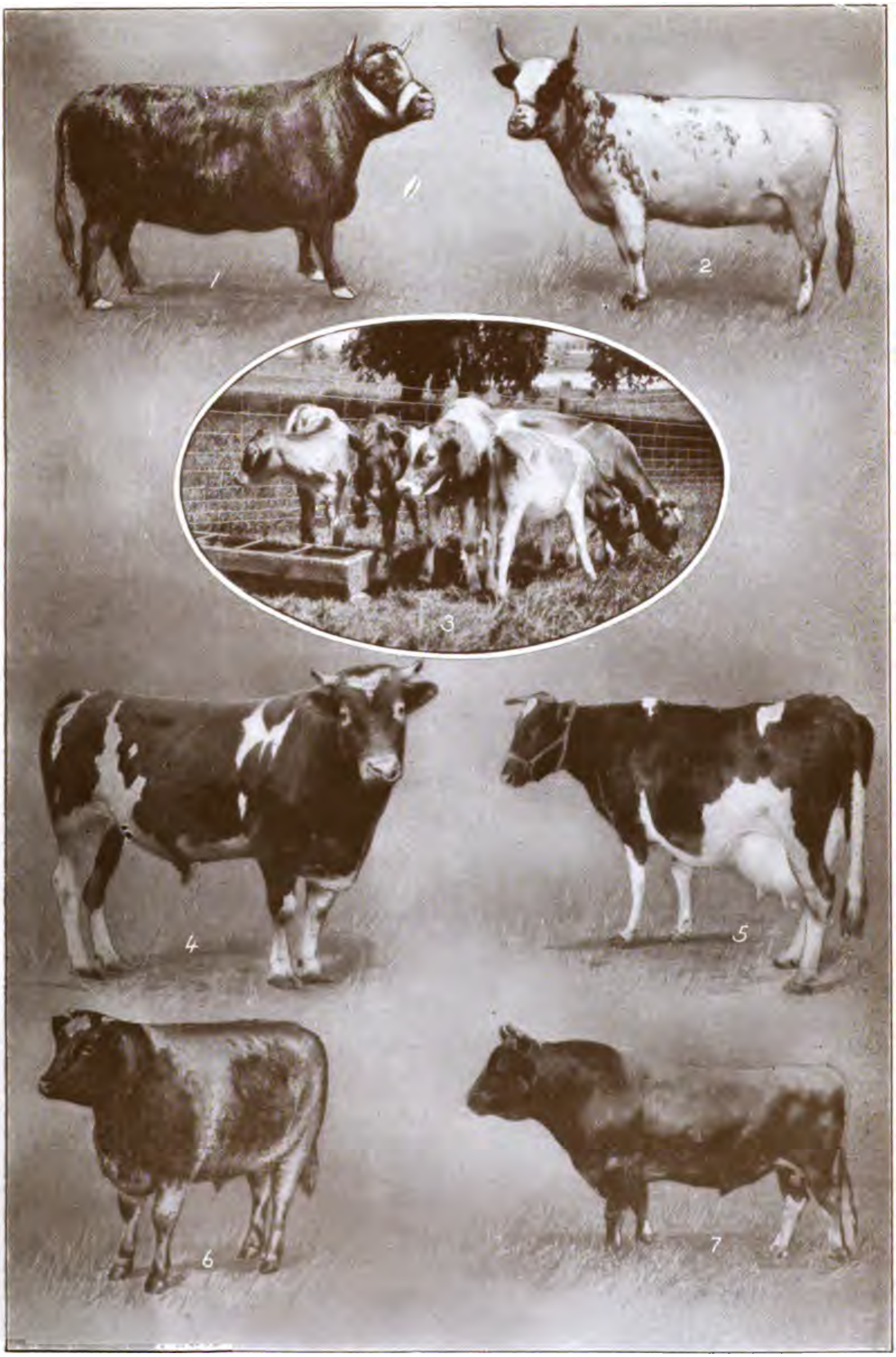

1. Dexter Heifer.
2. Ayrshire.
3. Group of Guernsey Calves.
4. Guernsey.
5. Holstein.
6. Shorthorn.
7. Jersey Bull.

feature of our meat products. Our herds have been singularly free from disease; and the superior quality of our pork products, and their low cost compared with that of European products, gave us an immense and growing trade abroad, furnishing a wholesome and cheap meat supply to the densely populated districts of Germany and France. But this trade was almost wiped out by adverse legislation on the part of the French and German governments; in 1910 only 4,410 hogs were sent abroad as compared with 15,909 in 1901; 33,915 in 1900, and 52,230, the highest number reached, in 1899.

Great wealth has grown up with American herds, and vital interests surround them. In many parts of the country dairying and animal production have driven out the growth of wheat and oats or other cereal crops, and although the population is not as dense in those regions as elsewhere, the inhabitants seem more prosperous, their houses and outbuildings are larger, and the annual profits are as great.

LAZARUS N. BONHAM,
Ex-Secretary State Board of Agriculture.

Live Stock, Derivation of. The domestic animals of the world have all been derived from wild stock, from which they differ in a greater or less degree, according as the need and variety of their services have called for changes in the course of their development from original types. In some cases the original stock has been completely lost, so that it can only be inferred or remembered by tradition. In others it is perfectly well known from what natural species the domestic races in question have descended, and this animal may still be found in a wild state.

The cattle of the world are the product mainly of three lines of descent. First, that which gave rise to the ordinary breeds known in Europe, America, and all those parts of the world that have been colonized by Europeans; second, the Indian humped cattle; and third, the varieties of the Asiatic buffalo. The last named are merely domesticated races of the existing wild buffalo of southern Asia, which are adapted to swampy lands and have been spread throughout that part of the world inhabited by Malays, and also carried to Egypt, the Senegal region and some other territories.

The common cattle of the United States have come down to us apparently along two lines of descent, which are continually mingled, especially in the interior parts of the country. The cattle of New England and the eastern half of the country generally, were brought primarily, and have since been supplemented by occasional importations, from Great Britain and the Netherlands. This stock owes its origin to the domestication following the Roman conquest of western Europe, of two species of wild oxen which roamed the forests of the continent of Europe, and were found numerously there by Cæsar and his army. One of these was a long-horned kind which seems also to have been indigenous to the British Isles. The other was apparently more southerly and easterly in its distribution.

Our horses are the highly varied product of the domestication of a species of horse which became entirely extinct anterior to any records. Its home, no doubt, was in the highlands of central Asia, and it was probably a small, shaggy, big-headed, dun-colored animal, more nearly resembling the Asiatic wild ass or kiang than anything else now known to us. It is possible that a separate pony was native to the forests of Europe, and that its blood may have been joined with that of the Asiatic horse in the formation of our present race, but of this we cannot be sure.

Sheep also are of unknown origin. It is probable, however, that they represent a combination of several species natives of the mountains of central Asia, some or all of which may be living but unrecognizable. The ordinary goat we know to be descended from the wild goat of western Asia, with possible admixture in the case of the Angora goats of the markhor or some other Himalayan species.

Swine are the domesticated races in Europe of the wild boar, which is still extant; and in the Orient of one or more local species of wild swine that still exist there in their native state.

Poultry are more easily traced than most of the larger domesticated animals. All of our barn-yard hens and chickens, curiously diversified as they have become, are the descendants of the jungle-cock of India, still to be shot among the foot-hills of the Himalayas. Similarly the ancestry of the peafowl, guineafowl and turkeys, is found in species of birds which we still know in a wild condition. Ducks and geese are of more diverse origin, but may be traced in most cases to the wild ducks and geese still prevalent in many parts of Europe and America, or else to certain well-known species of the Orient.

Liver. The liver is the largest glandular organ of the body. In man it is situated on the right side of the abdominal cavity immediately beneath the diaphragm. Its weight in the adult is approximately from 3 to 4 pounds, and its size is roughly indicated by the following measurements: greatest diameter about 12 inches anteroposterior diameter about 7 inches, thickness at different parts from 1 to 3 inches. The organ is divided into five lobes, of which the right and left are the principal ones; the former comprising the greatest part of the bulk of the entire organ. On the under surface may be seen a square lobe lying anteriorly between the right and left lobes, and known as the quadrate lobe. In a similar position between the right and left lobes at the posterior part of the organ is the Spigelian lobe, while a bridge-like lobe extending from the latter to the right lobe is known as the caudate lobe. The upper surface of the right and left lobes is convex and fits into the arch of the diaphragm. The lower surface of the organ is more or less concave, and is divided by five fissures. Of these a longitudinal furrow extends from the anterior to the posterior border of the organ separating the right from the left lobe; a transverse fissure extends at right angles from this at a point somewhat nearer the posterior than the anterior surface; it divides the longitudinal fissure into an umbilical fissure in front (so called on account of its lodging the umbilical vein in the fœtus) and the fissure of the ductus venosus behind (on account of its lodging the ductus venosus in the fœtus). Between the lobus Spigelii and the right lobe of the liver is the fissure of the inferior vena cava, lodging that vein, while at the anterior edge of the organ at the side of the quadrate lobe is a fissure which accommodates the gall-bladder. The transverse fissure is the most important, as it serves for the entrance into and emergence from the organ of the blood-vessels, nerves, and hepatic ducts.

The liver is held in place by five ligaments, four of which are simple folds of peritoneum, while the fifth, or ligamentum teres, is a round cord formed by the obliteration of the umbilical vein and extending from the anterior edge of the liver at the notch between the left and right lobes to the umbilicus and along the under surface of the liver to its posterior border. The peritoneal folds which serve the purpose of ligaments are a longitudinal one extending on the upper surface of the organ from the notch in front to the posterior border, a coronary ligament which is found along the posterior border, and a right and a left lateral ligament. These peritoneal reflexions serve to hold the organ in place, keeping it more or less firmly in apposition with the diaphragm.

The blood-vessels entering the liver are the hepatic artery and the portal vein; the former being a branch of the cœliac axis, the latter being the large venous trunk which is formed by the union of the superior mesenteric and splenic veins. Both the hepatic artery and portal vein divide in the transverse fissure into two parts, a right and a left, which enter the substance of the right and left lobes respectively.

The hepatic veins are the efferent veins of the liver conveying the blood from this organ into the inferior vena cava. In addition to these vessels, the liver, like other organs, is supplied with large and numerous lymphatics. The nervous supply of the organ is derived from the left pneumogastric, the hepatic plexus of the sympathetics, and from the right phrenic nerve. The bile ducts and hepatic ducts will be described below.

The gall-bladder is a small pear-shaped sac lying on the under surface of the liver. At its narrow end it opens into a small duct (cystic duct) which passes back and down to join the hepatic duct forming the common bile duct, which terminates in the duodenum. The gall-bladder is the reserve sac in which bile is stored and by the contracting of which a uniform flow of this liquid is maintained.

Structure of the Hepatic Substance.—The substance of the liver is made up of lobules of more or less equal size, separated by areolar connective tissue, which is a continuation of the fibrous covering of the organ or *capsule of Glisson.* In these fibrous septa between the lobules are found the larger blood-vessels, biliary ducts, lymphatics, and nerves. The lobule under a low power of the microscope is seen to be composed of radiating columns of liver cells converging to a central point in which is situated a large vein (intra-lobular vein) belonging to the system of the inferior vena cava. The columns of liver cells branch and anastomose with each other, and between them are spaces occupied by blood capillaries and the primary biliary passages. The liver cells themselves are polyhedral in shape, and are so arranged that a capillary space, known as the biliary capillary, is left between them. The capillary blood-vessels are similarly formed by the peculiar juxtaposition of the liver cells, leaving spaces in which the capillary blood-vessels extend from the terminal branches of the portal vein in the septa at the periphery of the lobules to the central vein already mentioned. The latter, collecting the blood from the capillary system, transports it to larger vessels known as sublobular veins, which finally unite and form the hepatic veins and discharge the blood into the inferior vena cava. The hepatic arteries and their terminal branches occupy the septa and supply blood to the connective tissue constituting the septa, and to the walls of the portal veins and biliary ducts. The venous blood of this distribution is discharged into the terminals of the portal vein within the septa.

At the periphery of the hepatic lobules, the epithelial cells of the hepatic columns continue directly into the smaller bile ducts which are situated in the interlobular septa. These primary bile ducts unite to form larger ducts and finally a right and left hepatic duct emerging from the transverse fissure unite to form a common bile duct. This is further joined by the *cystic duct* or duct of the gall-bladder, and it terminates in the duodenum in a common orifice with the pancreatic duct.

The structure of the liver is such that the blood entering through the portal circulation comes in contact with the liver cells on one side while the capillary biliary passages are on the other side of the hepatic cell.

The lymphatic vessels accompany the portal vein and hepatic artery, and another system accompanies the branches of the hepatic vein. The capillaries penetrate into the lobules, passing between the hepatic cells.

Functions of the Liver.—The physiological functions of the liver are probably very numerous and are but imperfectly understood. The position of the organ indicates that one of its important functions is the elaboration of materials presented by the blood coming from the gastro-intestinal tract, and probably also the purification of this blood. As far as they are known, the functions of the organ may be divided into the *metabolic* and *biliary.*

Metabolic Functions.— It is known that the liver acts upon sugars and other carbohydrate materials to convert them into glycogen which is stored up by the hepatic cells. This accumulates during digestion and is utilized in the intervals, so that the percentage of sugar in the blood is kept at an approximately uniform standard. It is known that in certain diseases (for example, diabetes), this function is greatly disturbed with resulting consequences that affect the general health. The liver shares with the muscles of the body this glycogenic function.

Another important metabolic function is that of forming urea, the final stage in the metabolism of albuminous food. Uric acid also is to some extent formed in the liver but is more particularly the product of the lymphatic organs and tissues.

Biliary Function.—The formation of bile is one of the important attributes of the liver, though possibly this function is less predominating than has hitherto been believed. The bile is an albuminous liquid containing bile pigments (bilirubin, biliverdin), bile salts (glycocholate and taurocholate of soda), nucleo-albumin, cholesterin, fat, and other less important substances including various salts. The bile is secreted more or less intermittently, the amount being greatest about the middle part of the day and increasing after meals. The daily output is from one to two pints. Its functions are numerous. Among other properties it aids in the absorption of fatty foods, stimulates intestinal peristalsis, and prevents intestinal fermentation, and is the vehicle of excretion from the body of certain waste products, notably hemoglobin. It is known that bacteria and other minute foreign bodies are discharged from the system through this medium.

Diseases of the Liver.—The diseases of the liver may be classified under the following heads: Derangements of the Circulation; Nutritional and Inflammatory Disease of the Substance of the Liver; Tumors; Parasitic Diseases; Functional Disturbance.

Circulatory Disturbances.—Congestion of the Liver is an increase in the volume of blood in the organ. This may be transient or more or less permanent.

(*a*) Transient congestion follows the ingestion of food and drink, especially when these are of stimulating quality. It is also occasioned by circulatory activity, such as accompanies fevers and other conditions of systemic excitement. In these cases the increase of blood in the liver is the result of an excessive supply of blood to the organ.

(*b*) Passive congestion is the form in which the outflow of blood from the liver is interfered with. This form is likely to be more or less durable or permanent. Among the causes, the most important are diseases of the heart and the lungs, or any other cause of obstruction to the circulation in the thorax.

Pathological Anatomy.—In active or acute congestion no marked alteration is observed on examination of the organ. In passive congestion the liver becomes enlarged, and the central veins within the lobules are seen to be increased in size, while the peripheral parts of the lobule often become light-colored from degeneration of the liver cells. This gives the surface of section of the organ a peculiar appearance that has been well designated "nutmeg liver." When passive congestion is long continued, the hepatic cells, compressed by the dilated blood-vessels and otherwise disturbed in their nutrition, undergo atrophy, while at the same time some fibrous tissue growth replaces the degenerated hepatic cells, and the whole organ becomes darker in color from deposit of pigment from the stagnated blood. The result is that the organ decreases in size, becomes harder, and of a darker color than normal. The term *cyanotic or red atrophy* is given to this condition.

The symptoms of congestion of the liver vary with the kind, the degree, and stage of the disease. In acute congestion, such as follows overindulgence in stimulating food and drink, a sense of heaviness in the region of the liver, and perhaps slight disturbances of digestion with general malaise constitute the symptomatology. In chronic or passive congestion, such as accompanies heart disease, the symptoms are quite distinctive. The organ increases in size so much that it is easily felt in the upper part of the abdominal cavity and it becomes tender or even acutely painful. Digestive disturbances are very common, partly as the result of the condition of the liver itself and partly as the result of the underlying condition which occasioned the congestion of the liver. Among these digestive symptoms, loss of appetite, difficult and painful digestion, nausea and vomiting are the most conspicuous. When the congestion of the liver is pronounced, more or less jaundice occurs. This results from the thickening of the walls of the biliary ducts and the compression of the finer biliary channels by the swollen state of the organ. In marked cases, the jaundice may be intense; usually it is slight.

In the last stages of congestion of the liver when the organ has undergone cyanotic induration, the symptoms may be similar to those of cirrhosis (q.v.).

Treatment.—The treatment of congestion of the liver is directed primarily toward the relief of the condition which causes the congestion. In heart diseases, cardiac tonics are important. Sometimes a prompt relief is obtained by venesection. Depletion from the portal circulation by brisk purgation may also be efficacious, and regulation of diet is important as the congested organ is less able to withstand injurious effects of stimulating foods or drink than the healthy liver.

Diseases of the Substance of the Liver.—Among these may be considered: (1) Simple atrophy; (2) acute yellow atrophy; (3) fatty liver; (4) cirrhosis, and (5) abscess.

Simple Atrophy of the Liver occurs in cases of starvation or inanition from long continued disease. A frequent form is that called *pressure atrophy* which is found in cases of deformities of the chest, in which the ribs are pressed inward against the liver, and as a result of tight lacing. The substance of the organ does not change very greatly in atrophy, though the individual liver cells are smaller than normal and usually somewhat pigmented, giving the structure a darker color. The shape of the liver is often peculiar. In the case of deformities of the chest, the pressure exerted by the ribs may cause deep grooves in the surface of the liver, or there may be a single transverse furrow at the lower margin of the ribs where this is pressed against the organ. In the case of deformity from lacing, part of the right lobe is frequently elongated and extends directly downward from the body of the organ as a more or less attenuated process.

The function of the liver is probably not seriously impaired in any of these cases, though some disturbance undoubtedly occurs.

Acute Yellow Atrophy is a disease in which a marked fatty degeneration of the cells of the liver is the important change. It is a rather rare condition, occurring in youth and early adult life; and has frequently been found in persons of dissipated habits. Parturition is one of the determining causes, and probably in many cases the disease is due to the action of micro-organisms, or to some form of poisoning. Phosphorous poisoning may cause changes in the liver and general symptoms sometimes quite indistinguishable from those seen in acute yellow atrophy unassociated with such poisoning.

The liver is decreased in size, often to a remarkable degree. It is soft and on transverse section the substance is of a light yellow color with mottled areas of reddish or purplish hue, the latter being portions in which the substance is congested or in which hemorrhages have taken place.

Changes are found also in various other tissues of the body, showing that acute yellow atrophy is not wholly a disease of the liver but a general infection or intoxication, having its most marked manifestations in the liver.

Symptoms.—After a period of indefinite digestive disturbances, acute jaundice, and marked nervous symptoms set in. The patient becomes deeply jaundiced, delirious, and sometimes comatose. In the course of ten days or two weeks the disease terminates fatally in a large percentage of cases. A small proportion of the cases recover. The treatment consists in stimulation or other measures called for by the general condition.

Fatty Liver.—There are two varieties of fatty disease of the liver, that known as ***infiltration*** and that termed *fatty degeneration*. In the former there is a deposition of fat in the liver cells, similar to that which is found in the subcutaneous tissues in ordinary obesity. In the latter the liver cells undergo destruction with formation of fat. Fatty infiltration may be the result of excessive supply of nutriment as in ordinary obesity, and is also found in certain states of general weakness and wasting, particularly in association with diseases of the lungs. In the latter cases, the cause is to be found in the deficient consumption of fat, owing to diminished oxygenation. Fatty degeneration may be caused by various infectious diseases, but is more particularly the result of poisoning with phosphorus, arsenic, mercury, and other poisons.

In fatty infiltration, the liver is enlarged, lighter than the normal organ in specific gravity and in color, and on section with a knife the increased fat is indicated by an oily character of the cut surface. In fatty degeneration the liver is usually diminished in size and the substance is of a friable softened character.

There are no characteristic symptoms of fatty infiltration, but the increased size of the organ may cause a local feeling of fulness and pressure, and vague disturbances of the general health may also be attributable to the condition. In fatty degeneration, the symptoms are equally obscure. That due to phosphorous poisoning may present itself with the symptoms of acute yellow atrophy (*vide supra*).

Cirrhosis of the Liver is the most frequent and important of the diseases of this organ. It is essentially a replacement of normal liver tissue by connective tissue, causing more or less hardening.

The causes of cirrhosis of the liver are numerous, though one in particular occupies a very prominent position on account of its frequency. The cause referred to is over-indulgence in alcohol, especially raw spirits, whence the terms alcoholic liver, gin drinker's liver, etc. It must not be supposed, however, that alcohol is the invariable cause. Over-eating, gouty conditions, syphilis, and various other infectious diseases may be followed by cirrhosis entirely like that caused by alcohol. It has been noted in the description of congestion of the liver that a form of cirrhosis (cyanotic induration) results from long standing congestion. Sometimes cirrhosis of a peculiar type is caused by obstruction of the biliary ducts. This produces a stagnation of the bile and an irritation of the substance of the liver that terminates in the formation of connective tissue.

Pathological Anatomy.—Two forms of cirrhosis of the liver are recognized. One, known as the ***atrophic***, in which the liver is decreased in size; the other, ***hypertrophic***, in which the organ is increased in size. In atrophic cirrhosis (hobnail liver, granular liver), the organ has an irregular nodulated or granulated surface, the irregularities being caused by the contractions of the connective tissue which forms the basis of this pathological state of the organ. The liver is decreased in size, though not always very notably. It is very firm, and on section the increased connective tissue can be recognized in the form of more or less distinct septa interlacing the lobules or groups of lobules of the liver substance. The lobules and groups of lobules are compressed by the contracting connective tissue, and as a result undergo atrophy and degenerative change. The connective tissue formation which is characteristic of this form of cirrhosis is found in the interlobular tissues surrounding the terminal branches of the portal vein. Consequently the portal circulation is obstructed, and congestion of the various abdominal organs whose blood is discharged through this circulation results. When cirrhosis has proceeded for some time, new channels of circulation may be established, by which the congestion of the abdominal organs is relieved. There results from this visible enlargement of the veins of the abdominal walls and increased size of the veins in the lower end of the œsophagus and in the rectum.

Hypertrophic cirrhosis of the liver is a form in which the liver is increased in size. The surface is usually smooth and the substance of a uniform character. This is due to the fact that the new connective tissue is uniformly distributed within as well as between the liver lobules. This form of disease may be the result of the same causes as the atrophic variety, but is more commonly due to obstructions of the flow of bile. Very commonly interference with the discharge of bile is found in this form, as interference with the circulation of blood is characteristic of the other variety.

Symptoms.— The symptoms of cirrhosis of the liver in earlier stages are very obscure and uncertain. Later interference with the portal circulation causes congestion of the mucous membrane of the stomach and intestines, with resulting disturbances of digestion, such as dyspepsia, vomiting, constipation, and even hemorrhages from the stomach or bowel. The spleen is enlarged from congestion of its substance and the last phase of the disease is marked by dropsical effusion in the abdominal cavity (ascites). Cirrhosis of the liver is a chronic disorder which may extend over a period of many years and which may be arrested even after it has reached an advanced stage. Among the symptoms of hypertrophic cirrhosis are tenderness and increase in the size of the liver, the development of jaundice, and sometimes the occurrence of fever. The disease is more rapid in its course than the atrophic variety.

Treatment.—The treatment of this condition is preventative rather than curative. When due to alcohol it may be arrested if not too well advanced, by a control of the habit of drinking; and a restitution of normal conditions may be favored by careful diet, including mainly the avoidance of stimulating or irritating food, and of general excesses of diet. The use of saline waters may be beneficial. When advanced to the stage of dropsy of the abdominal cavity, depletive measures, such as are used for the relief of dropsies in general, may be useful; or it may be necessary to remove the liquid by tapping.

Abscess of the Liver may result from dysentery and other ulcerative conditions of the intestines, in which cases the abscess is likely to be solitary; or it may accompany a septicæmia originating in the abdominal cavity from some local disease like appendicitis or puerperal infection, in which case multiple small abscesses are found throughout the substance of the liver. Another variety of multiple abscess is that in which obstructions of the biliary ducts by gall-stones occasions retentions of bile and the formation of local foci of suppuration.

Abscess is more common in tropical countries, probably on account of the greater frequency of dysentery in such localities. The direct cause of this form of abscess is probably the Amœba coli which bears a causative relation to certain forms of tropical dysentery.

Pathological Anatomy and Symptoms.—The liver is enlarged, and sometimes a projecting mass can be seen in the upper right portion of the abdomen. The abscess may be of small size, but frequently reaches very considerable proportions, containing perhaps a pint or more of thick pus. It may discharge externally through the skin, into the abdominal cavity or some of the abdominal organs, and even through the diaphragm, into the lung and bronchi. Occasionally a spontaneous cure results in this way. More commonly the patient perishes before the abscess ruptures, from general infection or from prostration. The disease is frequently attended with great pain, with jaundice and with irregular fever.

Treatment.—The only effective treatment of abscess is surgical operation.

Tumors.—Among the tumors of the liver, the most important is cancer. This is usually secondary to cancer of the stomach or intestines. It may, however, be primary in the liver. The liver is found enlarged and its surface irregularly studded with nodules varying in size from that of a pea to that of an apple, or even larger masses. The cancerous nodules are of white or pinkish color and the liver substance between them is usually more or less compressed and pigmented.

Symptoms.—The important symptoms are profound disturbance of general health with emaciation, such as characterize cancer in any part of the body; pain in the region of the liver, and increase in the size of the organ; jaundice of intense and lasting character; and occasionally dropsy of the abdominal cavity.

Parasitic Diseases.—The most important of these is the *hydatid cyst,* which results from the lodgment of the embryo of the Tenia echinococcus, a tapeworm occurring in the adult state in the intestines of dogs and some other animals. In man the larval condition alone is met with. The embryo in the liver becomes surrounded by a capsule in which a light liquid collects and thus a *cyst* is formed. Secondary cysts (daughter-cysts) may develop within the original one and thus a large cavity filled with smaller spherical cysts may result. The liver increases in size and the cyst may be visible, or it may be felt through the abdominal walls as a resilient projecting mass. The hydatid cyst may subsequently contract by absorption of its liquid contents or it may rupture in the same manner as an abscess. The symptoms of this disease are frequently obscure, but jaundice (from pressure on the bile ducts), dropsy of the abdominal cavity from pressure on the portal vein, and other «mechanical» symptoms may occur.

Jaundice.—The important functional disturbance of the liver is jaundice. This condition is one in which the biliary coloring matter is absorbed by the blood and deposited in the tissues of the body. The causes of jaundice are very numerous. The condition may result from any cause of obstruction of the outflow of the bile through the biliary ducts or from any serious disease of the liver substance, such as abscess, cancer, acute yellow atrophy, etc. Various poisons and infectious diseases cause jaundice by their destructive action on the liver.

The most frequent form of jaundice is that known as ***simple catarrhal jaundice,*** which results from digestive disturbances, especially such as follow great excess in eating or drinking and exposure to cold. In this variety, the outflow of the bile is impeded by swelling of the mucous membrane of the duodenum where the common bile duct discharges, and also by swelling of the lining membrane of the larger bile ducts themselves. When the bile formed within the liver cannot find normal discharge, it is absorbed into the blood, and finding its way to various parts of the body, discolors these, causing the yellow appearance of the skin and mucous membranes which characterizes the disease. The bile may be in part discharged from the body through the urine, and even in the sweat, tears, and other liquid discharges.

Symptoms.—The symptoms of catarrhal jaundice are, in the first place, those of intense disturbances of digestion, such as great pain in the region of the stomach, nausea, and vomiting; later, the appearance of a yellowish discoloration of the skin and mucous membranes. The fæces become light-colored from the absence of biliary coloring matter, and in advanced cases they are actually a light clay color or even white. The urine becomes dark brown or greenish in color. The patient is depressed, often even melancholy. The pulse is slow; the temperature as a rule is depressed, though there may be a moderate degree of fever.

Treatment.—Careful dieting is an essential in the treatment. The patient must abstain from food entirely at first, and later take the less irritating of foods, such as milk, broths, and the like. Remedies, like bismuth, pepsin, small doses of calomel, and salines are administered to improve the state of digestion and lessen the congested condition of the stomach and duodenum. Drastic purgatives are harmful. Warm applications over the region of the liver are efficacious. The disease usually subsides in a few days or in a week or two.

Gall-stones.— Gall-stones are usually formed within the gall-bladder. Very rarely they may originate in the biliary ducts within the liver. They result from inspissation of the bile and inflammatory conditions in which exfoliated epithelial cells or mucus in the gall-bladder or biliary ducts accumulate and form a basis for concretion of thickened bile. The gall-stone consists of biliary pigment matters, but in some cases almost wholly of one of the constituents of bile, cholesterin. On section through a gall-stone, a central nucleus may be seen which is composed of epithelial detritus and inspissated mucus, together with bacteria in many cases.

Around this is deposited cholesterin or biliary pigment. The gall-bladder may contain a single stone or, more commonly, a number, and sometimes even hundreds are found.

Gall-stones are more common in women past middle life than in younger persons or in the male sex.

Symptoms may be wanting until a stone enters the cystic duct and becomes lodged in the latter, or passing through this, becomes obstructed in the common bile duct. The symptoms of such a passage of gall-stone are known as biliary colic. The patient is seized with intense pain, radiating to the right and to the back, sometimes as high as the right shoulder. Vomiting and other reflex disturbances and even collapse may occur. When the stone lodges, jaundice is the most pronounced symptom. Frequently the gall-stone passes with some effort and the paroxysm is relieved. Sometimes this relief is brought about by a recession of the stone into the gall-bladder.

Treatment.—The treatment of gall-stone consists of careful diet and the use of saline waters to improve the digestive conditions and render the bile as liquid as possible. Gall-stones may thus be diminished in size and enabled to pass through the ducts. During the paroxysm of biliary colic, remedies to relieve pain are imperatively necessary. Hypodermic injections of morphine and even narcosis with ether or chloroform may be required. Surgical operation for removal of the stone is often desirable.

ALFRED STENGEL, M.D.

Liver-leaf, or **Noble Liverwort.** See HEPATICA.

Liv'ermore, Mary Ashton Rice, American reformer and lecturer: b. Boston, Mass., 19 Dec. 1821; d. Melrose, Mass., 23 May 1905. She was married in 1845 to Rev. D. P. Livermore, a Universalist minister (d. 1899), and was early in life active in the anti-slavery and temperance movements. In 1862 she was appointed agent of the Northwestern branch of the United States Sanitary Commission at Chicago and after the Civil War period was conspicuous in her efforts to promote the woman suffrage and temperance movements. She was president of the Massachusetts Woman's Suffrage Association and for 10 years president of the Massachusetts Woman's Christian Temperance Union. Among her popular lectures are: 'What Shall We Do with Our Daughters?'; 'Women of the War'; 'The Moral Heroism of the Temperance Reform.' She is the author of 'Pen Pictures' (1865); 'Thirty Years Too Late' (1878); 'My Story of the War' (1888); 'The Story of My Life' (1897); etc.

Liverpool, England, a city, municipal, county, and parliamentary borough, and seaport, three miles from the sea, and extending about eight and a half miles along the east side of the river. The port of Liverpool extends from Hoylake, at the mouth of the river Dee along the Cheshire coast of the river Mersey to Ince Ferry, and from Dungeon Point on the Lancashire coast of the river to Formby Point at its mouth. Liverpool is (by rail) 201 miles N.W. of London, 251 miles from Harwich (N.W.), 92 miles from Birmingham (N.W.), 34 miles from Manchester (W.), 96¼ miles from York (S.W.), 124 miles from Hull (S.W.), and 227 miles south of Edinburgh.

Area.—The area of the city is 14,909 acres (23 square miles); the ratable value £4,470,837. The population in 1905 (officially estimated) was 730,143. The following statistics of population will show the comparatively rapid growth of the city: 11,833 (1720); 35,600 (1770); 77,708 (1801); 376,065 (1851); 517,980 (1891); 684,958 (1901); 730,143 (1905). The great advance in the population in later years indicated by these figures is partly explained by the extension of the city boundaries so as to take in several adjoining townships.

Divisions.—The city is divided into nine parliamentary divisions returning nine members to Parliament; and into 35 wards, returning 137 members to the city council.

Public Buildings.—Down to the middle of the 19th century Liverpool contained very few public buildings, the streets were narrow and architecturally unattractive. During the last 60 years a complete change has taken place, and within a radius of half a mile from the Town Hall the city has been rebuilt; new streets have been made, and old ones widened. The following are amongst the most important of the public buildings:

St. George's Hall, opened 1854, cost £328,500; Town Hall, 1795, cost £170,490; Municipal Offices, 1867, cost £141,170; Post Office, 1899, cost £400,000 (including site); Picton Reading Room, 1878, cost £20,000; Central Technical Schools, 1901, cost £110,000; University Buildings, cost £220,000 (including sites). The William Brown Library and Museum (1860) and the Walker Art Gallery (1877) were the gifts of the generous citizens whose names they bear. The Royal Infirmary, The Blue Coat Hospital, and the Seamen's Orphanage are handsome buildings devoted to the cause of charity.

Many of the buildings associated with commerce have been designed by some of the foremost architects of the day and must be ranked amongst the finest in the city.

With the completion of the three great buildings now in progress, viz.: the Cathedral, the Dock Offices, and the Cotton Exchange, Liverpool, from an architectural point of view, will be unsurpassed by any provincial city or town in the United Kingdom.

Libraries.—The Free Public Libraries of the city consist of one large Central reference library (already referred to) and nine lending libraries and reading rooms. The central reference library contains upwards of 130,000 volumes, and the branch libraries 106,000 volumes. The total number of volumes issued in 1904, exclusive of magazines and reviews, was 2,052,896. An extension of the reference library is being made at a cost of £10,000 to receive the Hornby collection of art books, prints and autographs. Other important libraries in the city are the Athenæum (founded 1798), The Liverpool Library (founded 1758), and The University (founded 1881). There are also special theological, legal and medical libraries.

Art Gallery and Museums.—The famous collection of pictures in the Walker Art Gallery is extremely valuable, and contains works by

Burne-Jones, Herkomer, Holman Hunt, Leighton, Millais, Albert Moore, Poynter, Briton Riviere, D. G. Rossetti, and others. Modern sculpture is also well represented. An autumn exhibition is held annually when the most important pictures of the year are placed on view. The Public Museums containing archæological, ceramic, and natural history collections (the latter including an Aquarium) are amongst the most popular institutions in the city.

Places of Worship.—The Bishopric of Liverpool was founded in 1880, when an endowment of £100,000 was raised by public subscription. There are over 100 churches in the city (which does not comprise the whole of the diocese). The various nonconformist denominations have amongst them about 190 places of worship.

Education.—The city possesses an efficient system of education. The elementary, secondary and technical schools are under the control of the City Council. There are a considerable number of scholarships to enable students to pass from the elementary to the secondary schools and on to both the Liverpool University, and the Universities of Oxford and Cambridge.

The Liverpool University was first established as a college in 1881, and obtained its charter as a University with power to confer degrees in 1903. The teaching staff numbers 150. The University is endowed both for teaching and research. In addition to the sum mentioned above as expended on the purchase of sites and erection of buildings, £460,000 have been spent in the endowment of chairs, lectureships, scholarships, and prizes. There is also an annual grant of £10,000 from the City Council.

Orphanages.—The city has several institutions devoted to the maintenance and education of fatherless children and orphans, while the "Cottage homes" wherein are trained pauper children have commanded the highest approbation.

Water, Electricity and Tramways.—The city and district are supplied with fresh water from Rivington in Lancashire, and Lake Vyrnwy, Montgomeryshire (Wales). The engineering difficulties connected with the supply of water from such distances have been very great and the cost proportionately heavy. The capital expenditure on the Liverpool Water Works has been about £5,250,000. The average rate of daily consumption of fresh water in the city is about 27,000,000 gallons. In 1896 the Corporation purchased the works and rights of the Liverpool Electric Supply Company at a cost of £400,000. Since that date the demand for electricity for light and power has rapidly developed and the undertaking has proved financially successful. The total capital expenditure was, on 31 Dec. 1904, £1,719,000. For many years a portion of the profits has been contributed to the rates of the city. In 1904 the amount so contributed, after paying all working expenses, charges for interest and sinking fund, was nearly £17,000.

In 1897 the Corporation decided to purchase the tramways, which down to that date had belonged to a Limited Company. The amount paid was £567,375. The overhead trolley system of electric traction was quickly substituted for the horse system hitherto in use. New routes were opened up, streets widened, the length of track nearly doubled, and fares reduced. The length of track is now over 100 miles and the average length of the penny stage 2 1-3 miles. The total capital expenditure to 31 Dec. 1904 amounted to £1,916,000. The amount contributed to the rates of the city in 1904 was over £27,000. So far the tramways have only been used for passenger traffic.

Insanitary Houses.—During the past 40 years the Corporation has spent large sums of money in the demolition of insanitary cottage property, and in the reconstruction of artisans' dwellings. The city is also well provided with public baths, including open air baths (free), and in the poor quarters of the town there are Corporation buildings efficiently equipped for public laundry work.

Parks, Etc.—The city possesses a number of fine parks, gardens, and recreation grounds. The total number of acres thus allotted to public use is about 1,100—including Sefton Park with 269 acres, the cost of which, including the laying out, was £410,269. About 100 acres of the above represent churchyards, and plots of land varying in size from ¼ of an acre to 3 acres, which have been turned into gardens and recreation grounds, thus greatly improving the appearance of many localities and adding to the pleasure of the inhabitants.

All the land here referred to has not been purchased by the Corporation. The Wavertree Play Ground, 108 acres, said to be the largest playground in the world, was the gift of a generous citizen, and cost about £100,000; while the Roby Estate (100 acres), situated on the eastern boundary of the city, has recently been purchased by Alderman Bowring and is to be dedicated to the use of the citizens. The total amount spent by the civic authorities in the purchase and laying out of land for parks, etc., is about £560,000, while the sum of £25,000 is annually spent in maintenance.

Hospitals.—The medical charities are on a very extensive scale. Some of the charities are old, but all are now housed in modern buildings possessing all the latest scientific requirements. Most of the charities are maintained by endowments and public subscriptions (the amount raised by subscription in 1905 was £15,469), but seven of the largest hospitals in the city have been built and are maintained by the Corporation, and in 1904 the sum of £46,000 was expended in their administration. In addition to the hospitals in the city there are sanatoria for consumptive patients at Delamere Forest and Heswall Hills. The Royal Southern Hospital has special arrangements for patients suffering from tropical diseases. The Queen Victoria District Nursing Association employs skilled nurses to attend the sick poor in their homes.

Railways.—Nearly all the British Railway Companies are connected with Liverpool. The London and North Western, the Lancashire and Yorkshire, and the Midland Railway Companies have large and commodious passenger stations. In 1895 a new riverside railway station was opened for the convenience of ocean travellers. The city is also connected by canals with the manufacturing towns of Lancashire, Yorkshire and the Midlands. Within recent years the Mersey Railway, which connects Liverpool with Birkenhead by a tunnel under the river, and the Lancashire and Yorkshire line to Southport were electrified, and the latter was connected at Seaforth with the Overhead Electric Railway which runs along the line of docks from The Dingle.

Trade and Shipping.—Liverpool has a few manufactures, but it is essentially a port.. So far as the export trade is concerned statistics prove that it is the leading port in the United Kingdom, while for imports it is second only to London. Not the least important part of the shipping industry is the ocean passenger traffic. Connected with the port of Liverpool are fleets of the largest ships afloat, and the daily sailings and arrivals of these steamers to and from all the great ports in the world draw to the city large numbers of emigrants and other passengers.

Docks.—The great trade of the port has developed the magnificent dock system of which veloped the magnificent dock system of which about 7¼ miles the river is fronted by a system of docks and basins of every imaginable type and variety. There are 63 wet docks, with a water area of 558 acres and a lineal quayage of over 35 miles. Additional land has recently been purchased with the intention of extending the docks at the north end. The warehouses of the port, particularly those devoted to the storage of grain and tobacco, are of gigantic dimensions, and fitted with every modern appliance. The great passenger steamers nearly all embark and discharge their passengers at the landing stage, which is one of the attractions of the city.

Landing Stage.—It is a floating structure 2,478 feet in length with a general width of about 80 feet. The northern portion of this stage is allotted to the use of the ocean going, and coasting steamers, while the southern portion is reserved for the busy ferry traffic across the river to the Cheshire coast.

River Dredging.—One of the most important duties of the Mersey Dock Board is the dredging of the river and increasing the depth of water at the bar. For this work the Board have two large hopper dredges, each of which cost £60,000. One of these vessels has dredged 39,000 tons of sand in 24 hours. By the end of the year 1902 nearly 29,000,000 tons of sand had been removed from the bar, at a total expenditure, exclusive of capital and interest, of £288,000. Before dredging was commenced the depth of water at low water of spring tides was 11 feet, whilst now under the same conditions there is a depth of 26 feet.

Such are the efforts necessary to maintain the city in that position so eloquently described by James R. Lowell in the words which appropriately close this notice: «Liverpool is one end of the three thousand mile loom on which the shuttles which are binding us all in visible ties more and more together are continually shooting to and fro.»

History.—The history of Liverpool practically dates from the issue of the letter patent, or charter, by King John in 1207, and the erection of a castle. This latter structure has long since disappeared, part of its site being now occupied by a statue of Queen Victoria. In 1709 a wet dock was constructed, the first in the kingdom. From this event dated the rapid extension of its commerce and population. In 1880 Liverpool was made the see of a bishop, and in that year a charter was granted constituting it a city. The town developed very slowly until after the Civil Wars, in which it played a prominent part, being besieged three times. The facts stated in this article will prove that Liverpool is in every sense of the word a modern city, its development during the 19th century being almost unparalleled.

Liverpool is justly proud of the distinguished men and women who have been either born within its boundaries or associated with it. There are statues of William Roscoe, William Ewart Gladstone, William Rathbone, and others, while the birthplaces of Mrs. Hemans, Arthur Hugh Clough and W. E. Gladstone have had memorial tablets placed on them. The house at Rock Ferry, wherein Nathaniel Hawthorne resided, is well known, but a tablet has not yet been placed upon it.

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George T. Shaw,
Master and Librarian, The Athenæum, Liverpool.

Liverpool, Nova Scotia, Canada, the capital of Queen's County, a town and port of entry on the south bank of the Mersey estuary at its entrance into Liverpool Harbor, 108 miles southwest of Halifax. It has large fisheries, and some manufactures of lumber, machinery, and shoes.

Liverpool, Charles Jenkinson, first Earl of, English statesman: b. Winchester in Oxfordshire, 26 April 1727; d. London, 17 Dec. 1808. He was educated at the Charterhouse School, London, and later entered University College, Oxford, whence he was graduated in 1752 with the degree of M.A. In 1761 he was elected to Parliament and during the same year was appointed to the post of Under Secretary of State; in 1763 became joint Secretary of the Treasury; was made Lord of the Admiralty by the Grafton Administration in 1766; became one of the vice-treasurers of Ireland in 1772; Master of the Mint 1776, and Secretary of War under Lord North 1778-82. He was appointed by Pitt in 1783 a member of the Board of Trade and continued to serve in that body till 1801, from 1786 serving as its president, but he did not enter public life from the time of his retirement from the Board till his death. In 1786 he became Chancellor of the Duchy of Lancaster; was created Baron Hawkesbury in that year and Earl of Liverpool, 1 June 1796. He published, among other works: ‹Discourse on the Conduct of Government Respecting Neutral Nations›; ‹Collection of All the Treaties of Peace between Great Britain and Other Powers from 1648 to 1783› (3 vols. 1785); ‹A Treatise on the Coins of the Realm› (1805); etc.

Liverpool, Robert Banks Jenkinson, second Earl of, English statesman: b. London 7 June 1770; d. there 4 Dec. 1828. He was the eldest son of Charles Jenkinson, first Earl of Liverpool. He was educated at the Charterhouse School and Christ Church College, Oxford, 1786-89; in the latter year travelled in Europe, reaching Paris during the French Revolution and witnessing the fall of the Bastile. He was elected to Parliament in 1790; in 1796 became Lord Hawkesbury by courtesy; in 1803 was created Baron Hawkesbury; and in 1808 upon the death of his father succeeded to the title of Earl of Liverpool. In Parliament he was prominently identified with the Tories; for seven years was a member of the India Board; in 1799 became Master of the Mint; and in 1801 became Minister of State for Foreign Affairs in the Addington cabinet, and while in that office negotiated the treaty of Amiens with Napoleon. On 12 May 1804, when Pitt was returned to power, he accepted the office of Home Secretary and became leader of the House of Lords and held that post until Pitt's death. During the Whig ministry of 1806-7 he led the opposition, but on 25 March 1807 was again appointed Home Secretary in the Portland administration. He held various portfolios during Percival's administration and when the latter was assassinated in 1812 became Premier and continued to direct English affairs until April 1827, when a stroke of paralysis forced him to resign office. He opposed the Roman Catholic emancipation movement and the reform of Parliament and his term of office was marked by a retrograde policy on the part of the ministry and widespread discontent among the people. Public finances were criticised as being poorly administered; the duty on imported grain was increased; and the policy of forcible repression was followed by him till 1826, but from that time he sought to modify and reform the burdensome Corn Laws. He was instrumental in sending Napoleon to Saint Helena and in readjusting French Affairs in 1815 and 1818.

Liversidge, Archibald, Australian chemist and mineralogist: b. Turnham Green, England, 17 Nov. 1847. He was educated at the Royal School of Mines and the Royal College of chemistry, and at Christ's College, Cambridge. In 1867 he was appointed acting instructor of chemistry in the Royal School of Naval Architecture; in 1870 became university demonstrator in chemistry at Cambridge; and since 1874 has been professor of chemistry, from 1883-1904 dean of the faculty of science, and from 1879-1904 fellow of the senate in the University of Sydney, New South Wales, Australia. He also founded the Australasian Association for the Advancement of Science. He has written 'The Minerals of New South Wales'; 'Reports upon Technical Education and Museums'; etc. For many years he edited the 'Journal' of the Royal Society of New South Wales.

Liv'erworts, or **Hepaticæ,** a group of cryptogamous plants, forming one of the two divisions of the class *Bryophyta* or *Muscineae* (moss-worts), and closely related to the true mosses (*Musci*), with which some of the species are apt to be confounded. They are either spread out in the form of a simple lobed thallus, showing differentiation into a dorsal (upper) and a ventral (lower) surface, or they are composed of a small ramified stem bearing sessile leaves in two or three ranks. Root-like bodies (rhizoids) attach the plant to its substratum. Many liverworts reproduce themselves by means of brood-cells (thallidia or gemmæ), formed asexually in cups on the surface, in leaf-margins, etc. They are also reproduced sexually by means of club-shaped antheridia, containing the male elements (antherozoids), and flask-shaped archegonia, containing each an egg-cell or oösphere. These sexual organs occur in groups either in small depressions or special outgrowths of the thallus, or as so-called flowers at the tips of the leafy shoots, or in the axils of their leaves. The spore-capsule is formed after fertilization within the archegonium, and the spores are often provided with hygroscopic elaters which assist in their dispersal. On germination a spore produces, not the common liverwort plant, but a very small filamentous protonema. There are four families of liverworts, namely, *Ricciaceae, Marchantiaceae, Anthocerotaceae,* and *Jungermanniaceae.* The first includes the duck-weed-like crystalwort (*Riccia natans*); the second the exceedingly common *Marchantia polymorphia,* formerly used as a basis for medicine for ailments of the liver (whence the name "liverwort"); and the last, which is much the largest family, comprises all the leafy, as well as some thalloid forms. The Hepaticæ are generally distributed over the world, and prefer situations similar to those occupied by the mosses. There are about 4,000 species, of which about 3,500 belong to the *Jungermanniaceae.* See authorities on cryptogamic botany, especially Cooke's 'British Hepaticæ' (1893); and Strasburger, 'Text-book of Botany' (1903).

Liv'ingston, Edward, American statesman: b. Clermont, N. Y., 26 May 1764; d. Rhinebeck, N. Y., 23 May 1836. He was graduated from the College of New Jersey in 1781, was admitted to the bar in 1785, was a New York representative in the 4th, 5th, and 6th Congresses (1795-1801), and was a leader of the opposition. In 1801 he was appointed by President Jefferson United States attorney for the New York district, and in that year became also mayor of New York. During the yellow fever epidemic in 1803 he was stricken with the disease, and during his illness $43,666.21, for which he was responsible to the United States government, were misappropriated by his fiscal agent. He confessed judgment in favor of the United States for $100,000, and resigned both his offices. In 1804 he began the practice of law and land speculation at New Orleans. At the time of the preparation for the battle of New Orleans, he was president of the committee of public defense, and Jackson's chief assistant. During the battle he served on Jackson's staff. In 1820 he was elected a representative to the State legislature of Louisiana, in 1823-9 represented the New Orleans district in Congress, and from 7 Dec. 1829 to 3 March 1831 was United States senator from Louisiana. In 1831 he became secretary of state in Jackson's cabinet. This post he resigned to become minister to France in 1833; and in 1835 he returned to the United States. He was a distinguished lawyer; and as secretary of state exercised strong influence on the administration of Jackson, whose state papers, including the Nullification proclamation of 10 Dec. 1832, are generally believed to have been written by him. Among his writings are: ‘System of Penal Law for the State of Louisiana’ (1826); ‘System of Penal Law for the United States’ (1828). His ‘Complete Works on Criminal Jurisprudence’ appeared in 1873. Consult the biography by Hunt (1864).

Livingston, Henry Brockholst, American jurist: b. New York 26 Nov. 1757; d. Washington, D. C., 19 March 1823. He was a son of William Livingston (q.v.), and graduated from the College of New Jersey in 1774, was commissioned a captain in the Continental army, and later became aide to Gen. Philip Schuyler in the northern department with rank of major. He was also aide to Gen. Arthur St. Clair, took part in the siege of Ticonderoga, and was present at Saratoga. Subsequently he was again with Schuyler and was promoted lieutenant-colonel. In 1779 he went to Spain as private secretary to John Jay, in 1782 on the return voyaage was captured by the British, and was for a time imprisoned at New York. In 1783 he was admitted to the bar and entered practice in New York. He was judge of the New York supreme court in 1802–7, and in 1807 became associate justice of the United States Supreme Court. On the organization of the New York Historical Society in 1805 he became its 2d vice-president.

Livingston, Peter van Brugh, American merchant: b. Albany, N. Y., October 1710; d. Elizabethtown, N. J., 28 Dec. 1792. He was graduated from Yale in 1731, at New York was active in the shipping business with William Alexander, Lord Stirling, and in 1755 provided the supplies for Governor Shirley's expedition to Acadia. He was long a member of the provincial council, and in 1775–6 was a delegate to the 1st and 2d provincial congresses of New York, of the former of which he was president. In 1776–8 he was treasurer of the congress. He was prominent in most of the measures that led up to the Revolutionary War, and was referred to by John Adams as «stanch in the cause.»

Livingston, Philip, American patriot: b. Albany, N. Y., 15 Jan. 1716; d. York, Pa., 12 June 1778. He was graduated from Yale in 1737, became a prosperous merchant in New York, in 1758–69 was a member of the Colonial assembly, of which he was speaker in 1768, but was unseated by the Tory majority because of his strong Whig views. In 1774–8 he represented New York in the Continental Congress, and in 1776 signed the Declaration of Independence. Subsequently he sat in the New York provincial congress, in the State assembly, and in the senate. His legislative services were many.

Livingston, Robert, English proprietor in America: b. Ancrum, Scotland, 13 Dec. 1654; d. Albany, N. Y., 20 April 1725. He emigrated to America in 1673, spent a part of a year at Charlestown, Massachusetts Bay, removed to Albany, N. Y., and was there in 1675–86 secretary of the commissaries who directed the affairs of Albany, Schenectady, and the region adjacent. In 1686–1721 he held the corresponding office of town-clerk. In 1686 he received from Gov. Thomas Dongan the grant of a large tract, which comprised extensive portions of the present counties of Dutchess and Columbia, and which was confirmed by royal charter of George I. in 1715. This tract was erected into the lordship and manor of Livingston, and as Livingston Manor has since been known. Livingston was the first to obtain the means for the equipment of the expedition of Capt. William Kidd (q.v.) against the pirates. He was elected member of the assembly for Albany in 1711, and sat for his manor in 1716–25. From 1718 he was speaker.

Livingston, Robert R. (the initial R. having been assumed for purposes of distinction), American statesman, commonly known as «Chancellor Livingston»: b. New York 27 Nov. 1746; d. Clermont, N. Y., 26 Feb. 1813. He was graduated from Columbia (then King's College) in 1765, was admitted to the bar in 1773, was for a brief period partner in legal practice with John Jay, in 1773–5 was recorder of New York city, lost this post through his revolutionary spirit, and in April 1775 was elected from Dutchess County to the New York State assembly. In 1776 he was sent by the assembly to the Continental Congress, where he was one of the committee of five appointed to draft the Declaration of Independence, which, however, he did not sign owing to his return to enter the provincial convention. He took his seat on 8 July 1776, and was of the committee to draw up a State constitution. Under this instrument he became the first chancellor of New York (1777–1801). He resigned from the Continental Congress in 1777, but was again one of its members in 1779–81. He was secretary for foreign affairs of the United States Confederation in 1781–3, in which post he conducted with much success the business previously entrusted to the committee of secret correspondence. As chancellor he administered the oath of office to George Washington on the latter's inauguration as first president of the United States (30 April 1789). In 1801–5 he was minister to France, in which capacity he, with James Monroe as additional plenipotentiary, concluded the treaty by which Louisiana was ceded to the United States for the sum of $15,000,000. He became the partner of Robert Fulton (q.v.) in experiments toward the employment of steam-power in navigation; launched a boat on the Seine, but was not fully successful; and later continued the work with Fulton in the United States, where in September 1807 the Clermont made the trial trip from New York to Albany in 22 hours, the average rate of speed thus being 5 miles per hour. Livingston also introduced merino sheep into New York, made general the use of gypsum for fertilizing purposes, was the principal founder (1801) of the New York Academy of Fine Arts and its first president, and was also for a time president of the New York Society for the Promotion of Useful Arts. He was styled by Franklin the «Cicero of America.» By act of Congress his statue was placed in the Capitol at Washington, as one of the two representative citizens of New York State, George Clinton being the other. He published ‘Essays on Agriculture,’ an ‘Essay on Sheep’ (1809), and some addresses. Consult the biographical sketch by De Peyster (1876).

Livingston, William, American statesman: b. Albany, N. Y., 30 Nov. 1723; d. Elizabethtown, N. J., 25 July 1790. He was graduated from Yale in 1741, was admitted to the bar in 1748, attained distinction in practice, was elected to the provincial legislature from Livingston manor, and in 1760 established himself at the well known country-seat of «Liberty Hall» at Elizabethtown, N. J. In 1774 he became a delegate for New Jersey province to the 1st Continental Congress, and later served in the 2d and 3d Congresses. He was a member of the committee of the 1st Congress that prepared the address to the people of Great Britain. In June 1776 he took command of the militia of New Jersey, with rank of brigadier-general, and was thereby prevented from signing the Declaration of Independence. On 28 Aug. 1776 he was elected first governor of New Jersey, and this post, having resigned his military command, he held until his death. During the first two years of his administration the State of New Jersey was perhaps more than any other exposed to the operations of the British forces, and this was the cause of many difficulties and dangers. The legislature was compelled to meet at various different places, and Tory hostility was strong against the governor, whose capture was several times attempted. In his message of 1777 to the assembly, Livingston recommended the abolition of slavery, and in 1786 caused the passage of an act forbidding the importation of slaves into New Jersey and himself liberated his two slaves. In 1787 he was appointed a delegate to the convention that framed the Constitution of the United States. He was at one time president of the «Moot,» the well known lawyers' club founded at New York in 1770. He published in 1752 52 numbers of 'The Independent Reflector,' a weekly periodical, in which he opposed the Episcopal Church. His writings include: 'Philosophic Solitude' (1747); 'A Funeral Eulogium on the Rev. Aaron Burr' (1757); and 'A Digest of the Laws of New York, 1691–1762' (with W. Smith, Jr., 1752–62). Consult Sedgwick, 'Life and Letters of William Livingston' (1833).

Livingston, Mont., city, county-seat of Park County; on the Yellowstone River, and on the Northern Pacific railroad; about 45 miles north of the Yellowstone National Park, and 100 miles southeast of Butte. It is situated in a mining and lumbering section of the State. A branch of the Northern Pacific railroad extends from Livingston to the Yellowstone Park. It is the division headquarters for the Northern Pacific. The railroad depot cost $75,000. Its chief manufacturing establishments are machine-shops, lime-works, railroad shops, and lumber-mills. Its trade is mainly in mining tools, wool, coke, coal, and gold, and it is a distributing centre for groceries, dry goods, and clothing for an extensive region. Livingston is a favorite resort for sportsmen, as game and fish abound. Pop. (1910) 5,359.

Livingston College, a coeducational institution founded in 1882, in Salisbury, N. C., under the auspices of the African Methodist Church. In 1910 there were connected with the school 24 instructors and 400 students. The library contains about 5,000 volumes; the buildings and grounds are valued at $130,000; and the productive funds $110,000. The college course leads to the A.B. degree.

Livingston Manor, at one time a large tract of land in New York State, on the east side of the Hudson River, and the northern part of what is now Dutchess County. This land was obtained by Robert Livingston, in 1674, and comprised about 160,240 acres. The title was confirmed in 1715, and the patent obtained gave the land to the heirs forever. In 1752–4 Gov. Clinton of New York had to settle a dispute as to the eastern boundary; Massachusetts and the Livingstons both claiming the same land. The manor was divided and subdivided into holdings which are let to tenants. In 1795 the tenants made an effort to have the title pronounced invalid, but it was decreed that the land was Livingston property. In 1844 the tenants again sought to get possession, and they petitioned the Legislature to set aside the grant; but the petition was not granted. Since that time the owners have sold to individuals the larger part of the old Livingston Manor.

Livingstone, lĭv'ĭng-stŏn, **David,** Scottish missionary and African traveler: b. Blantyre, Lanarkshire, 19 March 1813; d. near Lake Bangweolo, Africa, 1 May 1873. His parents had settled in the neighborhood of the cotton mills near Blantyre, where David became a «piecer» at the age of 10. While at work in the mill he learned Latin and read extensively, and having attended the medical and Greek classes at Glasgow University during the winter months, finally became a licentiate of the Faculty of Physicians and Surgeons of Glasgow. Under the direction of the London Missionary Society he proceeded in 1840 to South Africa, where he joined Robert Moffat in the missionary field. His first station was in the Bechuana territory, and here his labors for nine years were associated with Mr. Moffat, whose daughter he married. Hearing from the natives that there was a large lake north of the Kalahari desert, he proceeded to explore that region, and discovered the valley of the Zouga and Lake Ngami. Subsequently he penetrated farther northwest until he reached Linyanti, the capital of the Makololo territory, situated on the Chobe, a tributary of the Zambesi, which river he also visited. In 1853–6 he made a great exploratory journey, or series of journeys. Starting from Linyanti he ascended the Leeambye (Upper Zambesi), journeyed overland to Lake Dilolo, and thence to St. Paul de Loanda on the west coast. Returning to Linyanti, he went eastward from there in 1855, tracing the Zambesi to the Indian Ocean, and reaching Quilimane on the east coast in 1856, having thus crossed the entire continent. The record of this journey is found in his 'Missionary Travels and Researches in South Africa' (1857). After making various journeys and exploring the Lake Nyassa and Zambesi region, Livingstone set forth in 1865 to set at rest the question of the sources of the Nile. From this time till his death he was engaged in laborious explorations in the lake region of South Africa, especially to the westward of Nyassa and Tanganyika, where he discovered Lakes Bangweolo and Moero, the Upper Kongo, etc. For about three years no communication had come from him, and the doubts regarding the traveler's safety were only set at rest when it was known that H. M. Stanley, the special correspondent of the New York *Herald,* had seen and assisted Livingstone at Ujiji, on Lake Tanganyika. They parted in March 1872, Livingstone going to explore the southern end of Tanganyika, and Stanley proceeding to Zanzibar. After another year's wanderings he was attacked with dysentery near Lake Bangweolo, and there he died. His body was buried in Westminster Abbey, having been conveyed to the coast, rudely preserved in salt, by his faithful followers. Consult: 'Livingstone's Last Journals' (1874); Stanley, 'How I Found Livingstone' (1873); Blaikie, 'Livingstone's Personal Life' (1880); Hughes, 'David Livingstone' (1891); Johnston, 'Livingstone and the Exploration of Central Africa' (1897); Machlachlan, 'David Livingstone,' in 'Famous Scots' Series (1900).

Livingsto'nia Mission, southern Africa, established in 1875 by the Free Church of Scotland, consists of two settlements with local branches. The first settlement was made at Cape Maclear at the southern end of Lake Nyassa, but the chief settlement is at Bandawè, on the west shore of the lake. The establishment of the mission was the result of a suggestion made by Livingstone (q.v.) that the shore of this lake was a good position for a mission that might counteract the slave trade which was carried on by the Arabs and Portuguese. The Church of Scotland established a mission at Blantyre, in the Shiré Highlands, near the lake. At Blantyre some manufacturing establishments have been established, a foundry, basket factory, cloth-mill (the cloth is made from the bark of trees), and a cotton factory. The Portuguese, in 1889, tried to get possession but since 1890 the British have had control.

Liv'ius, Andron'icus, Roman poet, by birth a Greek of Tarentum. He first went to Rome at the commencement of the 3d century B.C. as instructor to the children of Livius Salinator. He introduced upon the Roman stage dramas after the Grecian model, and wrote a translation of the 'Odyssey' in the old Saturnine verse. His fame, however, rests chiefly upon his hymn written in celebration of the battle of the Metaurus River.

Livo'nia, Livland, or **Riga,** Russia, a Baltic province, bounded north by Esthonia, west by the Baltic Sea, south by Courland, and east by Vitepsk and the Lake of Peipus; length, 178 miles: breadth, 111 miles; area, about 18,158 square miles. The surface is for the most part flat, sandy, and swampy; the only hilly ground is in the districts of Venden and Dorpat. The government is well watered by the Dwina or Duna, and Embach; its principal lakes are the Vertserf and Luban. The climate is subject to extremes of heat and cold. Notwithstanding extensive tracts of sand, the greater part of the government is under cultivation, and yields good crops of oats, barley, wheat, potatoes, flax, and hops. The forests are extensive, and furnish good timber. Horses, cattle, and sheep are generally of small inferior breeds. Distilling, sugar refining, and the manufacture of tobacco, woolens, cotton, and linen, are the chief industries. The inhabitants consist of Livonians, of Russian, Swedish and German origin, who form the landed proprietors and governing class, and are divided into the nobility and bourgeoisie; and Esthonians and Letts, who form the peasantry, and though no longer serfs (having obtained their freedom in 1824), are bound to perform certain oppressive duties for the lords of the soil. The Esthonians occupy the north and east portion of Livonia; the Letts the south and west. The Esthonians are of the Finnish stock (see Finns); the Letts, like the Lithuanians, belong to the Slavonic stock, and speak a language of their own (Lettish). Of the original inhabitants of the country, the Lives or Livonians proper, who are also of Finnish race, only a thousand or two are all that are left. The inhabitants are almost all Protestants of the Augsburg Confession. The capital is Riga. Pop. about 1,300,000.

Livre, lē'vėr, an ancient French coin, now superseded by the franc, to which it was about equal in value.

Livy (Titus Livius), Roman historian: b. Patavium (Padua) 59 B.C.; d. there 17 B.C. He spent most of his time at Rome, but kept aloof from active political life, although among his friends were numbered the most eminent men of his day. In spite of his republican leanings, he was befriended by Augustus, who counted him with Virgil and Horace, as one of the literary ornaments of his court. His principal work is the 'History of Rome' in 142 books (*Titi Livii ab Urbe Condita Libri*), which comprehends a period extending from the building of the city to the year 9 B.C. Only 35 of these books are extant, namely the first 10, which cover the period ending 293 B.C., and the 25 from the 21st to the 45th books, which comprehend the years between 218 and 167 B.C., as well as a number of fragments, and short abstracts, or tables of contents of all the books excepting the 136th and the 137th. Livy undertook this work, as he states in his preface, partly that he might plunge his mind into things of the past, and so forget the grievances of the present, and partly that he might spread out before his contemporaries a picture of the nation's ancestral glories. He has indeed produced a work which is truly national, which has always received the admiration and esteem of antiquity, and is in modern times regarded as one of the most precious relics of Latin literature. Since his time it has been the source of all knowledge of the period it deals with. He began its composition between the years 27 B.C. and 25 B.C., and published it from time to time in a series of detached parts; the present division into decades is of later origin. It appears that he was engaged upon his history up to the time of his death, but failed to carry it on to the end he had meditated, which would have included the death of Augustus. He had a practical object in view in the accomplishment of his task, but this was less to achieve a critical and scientific exploration of the past, than to produce a moving, lifelike, and readable representation of the time and country in which he lived. With this end in view he has chosen a style of his own; not the transparent splendor of Cicero, nor the condensed and epigrammatic pungency of Tacitus, nor the dilettante, though sometimes effective, archaism of Sallust. His narrative moves along with stately dignity; it teems with anecdote, and glows with patriotic emotion. He employs a phraseology remarkable for copiousness, for picturesqueness, for vivid description and occasionally for an eloquence that is burnished into poetic lustre. His materials must mainly have been derived from preceding annalists, but he weaves into his work the local traditions of a mythic age, and rivals Virgil in his love for the fables of Tuscany and Latium. His account of the Punic wars he draws from Polybius. We must not, however, expect to find in his writings a clear account of the origin and development of the Roman constitution. He seems to have cared little for the study of constitutional law, and even less for that of military art. Yet his political views were very decided, and in his account of the civil war, which resulted in the downfall of the Republic, he shows himself a strong partisan of the aristocratic party, so that Augustus did not hesitate to style him a Pompeian. The historic basis for the Roman history of Livy cannot be fully understood without reading the works of Niebuhr. Livy's complete works have been published by Gronov (1679); Drakenborch (1828); Zingerle (1883); and a translation of them appears in the Bohn Library. Fügner's 'Lexicon Livianum' (1889) is important in Livian literature. Consult: Niemann, 'Etudes sur la Langue et Littérature de Live' (1884); Taine, 'Essai sur Tite Live' (1888); Madvig, 'Emendationes Livianæ' (1877).

Liz'ard Point, or The Lizard, England, a headland in Cornwall, forming the southernmost point of Great Britain, 24 miles southeast of Land's End, and having two lighthouses with fixed lights 224 feet above sea-level.

Lizards, animal reptiles of the order *Lacertilia* which, together with the *Ophidia* (serpents), form the higher group *Sauria*. The one important character distinguishing lizards from snakes is the fact that the mandibles of the lower jaw are solidly united in the former and not in the latter. The lizards have generally two pairs of limbs, but one or both pairs may be absent (as in the amphisbæna), and the toes may vary in number from two to five. Though the front limbs may be wanting, the pectoral arch or bones of the shoulder-girdle are still represented; but when the hinder limbs are wanting, the pelvic arch also disappears. The spine is generally elongated, and a tail of considerable length is generally present. In most *Lacertilia*, the vertebræ are either hollow in front and convex behind (procœlous), or hollow at both ends (amphicœlous), the former condition being much more common than the latter. The cervical or neck-vertebræ may be furnished with ribs, and those of the back or dorsal region generally become united to the sternum or breast-bone. In the flying-lizard or dragon some of the hinder ribs become elongated and extended to form a support for the wing-membrane, by which this lizard is enabled to sustain itself in the air. The teeth are simple in structure, are not lodged in distinct sockets, and they generally become united to the jaw-bones with age. They vary much in form, from a toad-like plumpness to the slender shape of a snake. The food of lizards is generally insects, worms, and various small animals, but some live on vegetable substances. The eyes are provided with movable eyelids, while the ear is usually to be perceived externally. The skin is generally covered with scales or horny plates, although the integument — as in the chameleons, *etc.* — may be soft; and the epidermis is shed in patches annually. In their reproduction lizards never undergo any metamorphosis, and are generally oviparous, but in some the eggs are retained until they hatch within the abdomen of the mother. Salivary glands are found which in *Heloderma* act as poison glands. The lungs are thin-walled sacs, from which terminal pouches may arise. The movement of the ribs assists in respiration. The lizards are most abundant in tropical regions, but are absent only from the cooler temperate and the frigid regions of the globe.

The *Lacertilia* are divided into three sub-orders, of which the following is an outline:

Sub-order 1. *Geckones.*— *Lacertilia* with four legs, amphicœlous vertebræ and clavicles dilated ventrally. The chorda persists and grows throughout life, in the centre of and between the vertebræ; the ribs are bifurcated, and dentition is pleurodont. Some species have mechanically adhesive disks. This is a very old group, modern species existing in tropical and southern European countries. See GECKO.

Sub-order 2. *Lacertæ.*— *Lacertilia* with procœlous vertebræ and the ventral part of clavicles not dilated. Eighteen families, as follows:

1. *Agamidæ.*— A family of exclusively Old World lizards, containing some 200 species, among which the Malayan dragon (q.v.), and the frill-lizard (q.v.) are remarkable species. Many have a very chameleon-like appearance and are known in India and Ceylon as blood-suckers (genus *Calotes*). The desert lizards of North Africa and southwestern Asia are mostly of this family. See AGAMA.

2. *Iguanidæ.*— A large and chiefly American family with pleurodont dentition, and a short, thick, non-protractile tongue. The genus *Anolis* contains the common "chameleon" of the southeastern United States. (See ANOLIS; CHAMELEON.) *Basiliscus,* of Central America has a great, erectile vestigial crest on the back and tail. (See BASILISK.) *Iguana* (q.v.) includes large edible lizards of Central and South America. *Phrynosoma* is the genus of the "horned toad" (q.v.), common in the arid region of the Great Plains and west to California. One of the most northerly species is the large, black, fat-bodied, bud-eating lizard of the sandy plains of southern California, known locally as Alderman lizard, or by the Indian name Chuckwalla; and scientifically named *Sauromalus ater.*

3. *Xenosauridæ.*—A Mexican family intermediate between the *Iguanidæ* and the *Anguidæ;* represented in Africa by (4) the *Zonuridæ.*

5. *Anguidæ.*— Terrestrial pleurodont lizards, with bony plates in the skin and the tail long and brittle, dwelling in Central America, Europe and India. *Ophisaurus,* the genus of the glass snakes (q.v.) of the Central States, has the limbs reduced to mere spikes. *Anguis,* the "slow-worm" (q.v.), has no limbs at all, and the eyes well developed.

6. *Helodermatidæ.*— Pleurodont, poisonous lizards of New Mexico and Arizona. See GILA MONSTER. The (7) *Lanthanotidæ* are Asiatic representatives of the foregoing.

8. *Varanidæ.*— Pleurodont aquatic lizards of the Old World, with bifid, protractile tongue. See MONITOR LIZARDS.

9. *Xantusiidæ.*— Three Central American genera.

10. *Tejidæ.*— A large tropical-American fam-

ily of large forest dwelling, carnivorous lizards of great strength and swiftness. See Teju.

11. *Lacertidæ.*— Typical small lizards of the Old World, with pleurodont dentition, and bony dermal plates over the temporals. About 100 species. All live on animal food, chiefly insects, worms and snails. The sand-lizard (*Lacerta agilis*) occurs in the Palæarctic region; the green lizard (*L. viridis*) inhabits central and southern Europe; and the wall-lizard (*L. muralis*) runs over the walls in Mediterranean cities.

12. *Gerrhosauridæ.*— African lizards intermediate between *Lacertidæ* and *Scincidæ*.

13. *Scincidæ.*— Pleurodont, viviparous lizards, with feebly nicked, scaly tongue. They live in sandy ground, where they make burrows in which they retreat. The limbs are in some groups reduced. The family contains about 400 species distributed all over the world. See Skink.

The following five families have become degraded on account of their burrowing instincts: (14) *Anelytropidæ*, worm-like, legless lizards of the tropics; (15) *Dibamidæ*, of Malay Archipelago; (16) *Anjellidæ*, worm-like lizards of California, limbs entirely absent; (17) *Amphisbænidæ*, worm-like blind, burrowing lizards which burrow like earthworms, especially in ants' nests and manure heaps. *Chirotes* of Mexico and California has the fore-limbs remaining; *Amphisbæna*, in tropical America, lives in ants' nests. See Amphisbæna.

(18) *Pygopodidæ.*— Snake-like lizards; fore-legs absent; hind-legs a pair of scaly flaps; Australasia.

Sub-order 3. *Chamæleontes.*—Old-World saurians, with compressed body and prehensile tail; tongue club-shaped and capable of being protruded to a distance equal to the length of the body; two digits of the feet are permanently opposed to three; head crested; eye-balls very large and movable on the two sides independently of each other; capacity for changing color conspicuous. See Chameleon.

For information on this group consult: Gadow, 'Amphibia and Reptiles' (1902); the 'Royal' and 'Standard' Natural Histories; and Boulenger's 'Catalogue of Lizards in the British Museum' (1885-7).

Lla'ma, one domesticated form (often specifically distinguished as *Lama glama* . of the huanaco (q.v.), the other being the wool-bearing Alpaca (q.v.). It is larger than the wild huanaco (about 3 feet at the shoulder), and may be white, brown, black, or variegated with patches of all three colors. This animal was domesticated long before the era of the Incas. When the Spaniards conquered Peru they found hundreds of thousands in use as riding animals and beasts of burden in the southern part of the country; and as they were the only domestic ungulate of the kind in South America their importance was very great. The Spanish conquerors adopted llamas as burden-beasts, and soon long strings, in charge of a few native drivers, were passing back and forth between the mountain mines and the coast, laden with ore or bullion or with supplies, a proper burden not exceeding 120 pounds, which may be carried about 12 miles a day. Until toward the middle of the 19th century this remained almost the only means of carriage in the Cordilleras, where the endurance of cold, ability to live on the mountain herbage, and sure-footedness peculiarly fitted them for this service. Only the mature males were used as burden-beasts, the smaller females being reserved for their milk and flesh, which resembles mutton, and is extensively eaten. Llamas produce only one offspring annually, so that care is needed to sustain the herds which are still numerous and valuable. Various breeds are known, but the differences are not very great. The wool is used among the native Indians for the manufacture of textile fabrics. The skin is made into leather. The dried dung is used for fuel, and the milk is also employed as an article of native diet. When irritated these animals have the habit of kicking at their adversaries, and they also eject the food when undergoing re-mastication in the mouth, along with quantities of saliva.

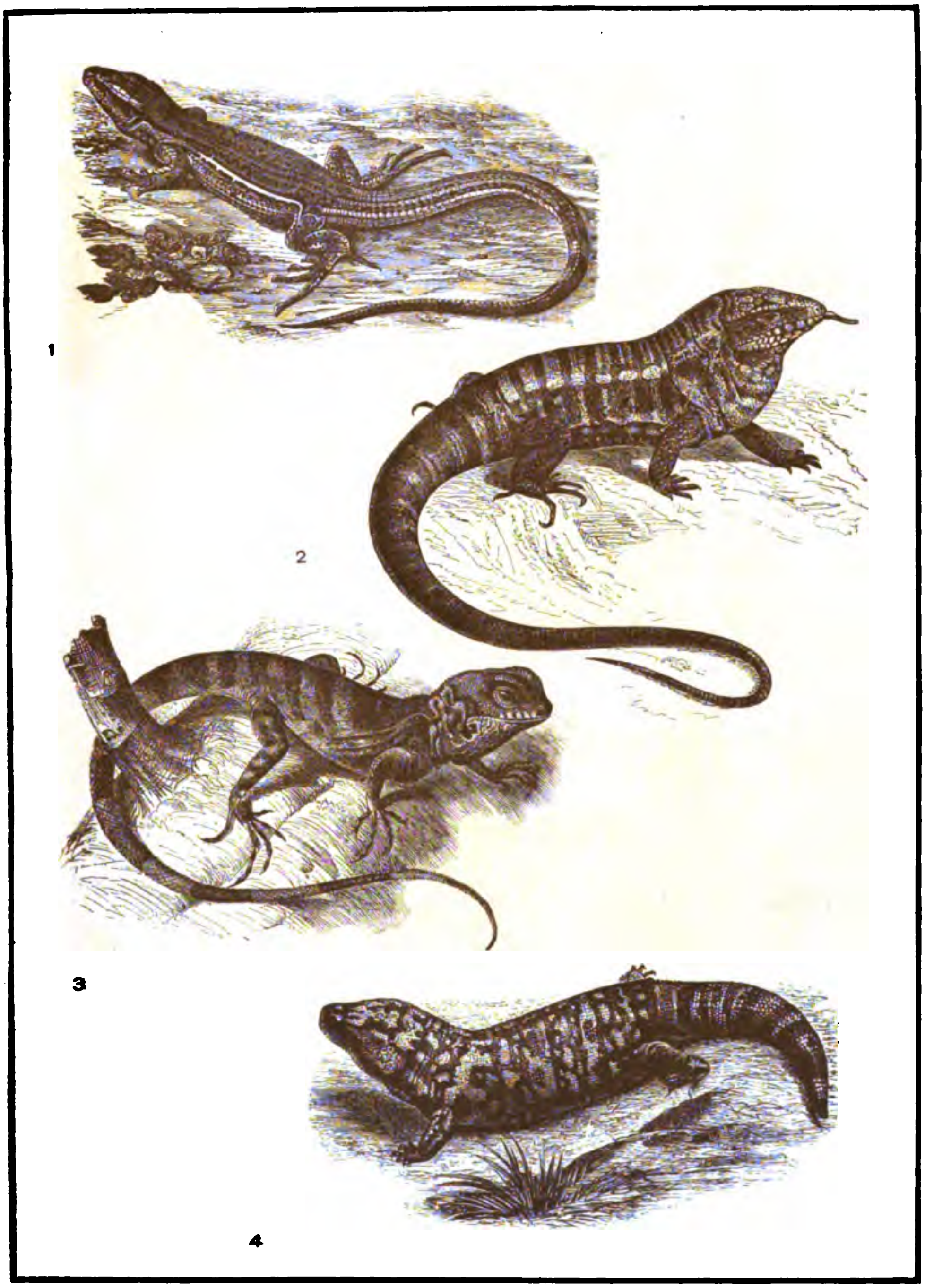
Llanelly, lă-nĕth'lĭ, Wales, a seaport town of Carmarthenshire, on the Burry, 14 miles southeast of Carmarthen. It is the outlet for the products of a great mining district, with extensive collieries, iron-foundries, copper works, tin-plate works, and lead and silver works. The trade is facilitated by commodious docks and ample harbor accommodation. Pop. about 25,000.

Llano Estacado, lä'nō äs-tä-kä'dō, or **Staked Plain,** Texas, an extensive plateau forming part of the Great Plains of the eastern slope of the Rocky Mountains, east of the Pecos River, in northwestern Texas and eastern New Mexico. It has an area exceeding 40,000 square miles, and is dry and almost woodless; water is obtained by boring. In the north the plateau has a general elevation of about 5,000 feet, but in the south is not over 1,000 feet high, the steep escarpments or palisades on all sides having suggested its Spanish title.

Llanos, lä'nōs or lyä'nōs, the name given in the northern part of South America, particularly in Colombia and Venezuela, to vast plains, almost entirely level, and interrupted only at intervals by detached elevations, called in Spanish, mesas. The superficial area of the llanos is estimated at 300,000 square miles; they extend from the delta of the Orinoco inland to the Yapura, a tributary of the Amazon. A large portion of them is sandy and without much vegetation, except on the banks of the rivers and during the wet season. At this period great stretches are inundated to the depth of 12 to 15 feet, owing to the rivers overflowing their banks. The villages must, therefore, be built on the elevated ground. Considerable portions are covered with forest; in the grassy regions great herds of cattle pasture. Not including the forest section, nor any of the foot-hills of the Andean Cordillera, the llanos of the northern part of South America would cover only about 150,000 square miles. The inhabitants of these plains are called Llaneros. They are a hardy, vigorous race, proud of their descent from the first Spanish colonists, although their mode of life resembles more that of the Indians than that of their boasted ancestors. Farther to the south such plains are called Pampas.

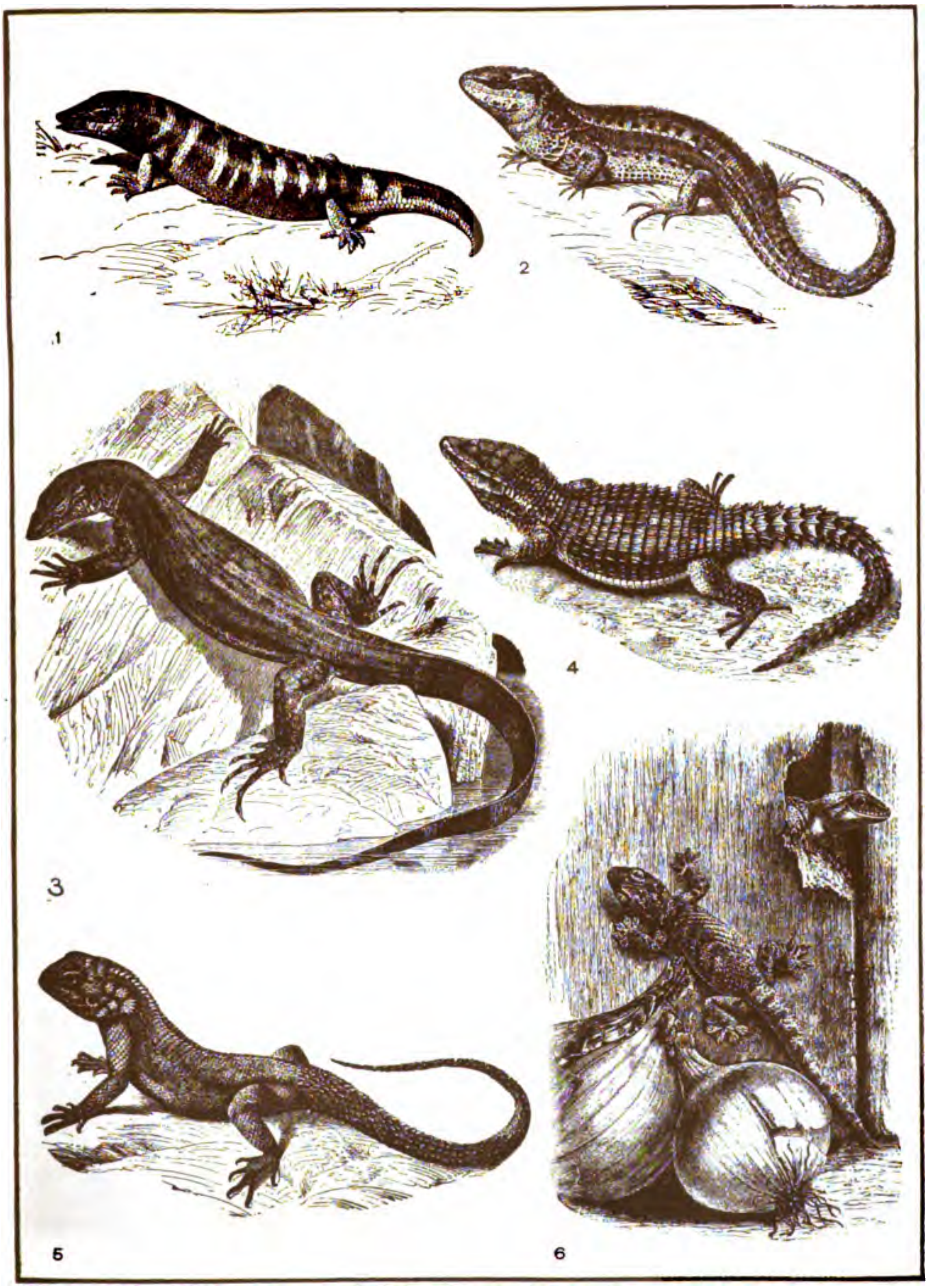
Llanquihue, lyän-kē'wä, a lake in the province of the same name, in Chile, South America. Largest lake in Chile; nearly circular in form, about 30 miles in length and the same in width. It is a deep lake, with only very small inlets.

AMERICAN LIZARDS.



1. Uraniscodon umbra.
2. Teju or Tupinambis.
3. Surinam ameiva.
4. Gila Monster or Heloderma.

OLD WORLD LIZARDS.



1. Skink.
2. Lacerta ogilis.
3. Nile Monitor or Varanus.
4. Zonurus cordylus.
5. Agama colonorum
6. Wall geckos.

Llorente, Juan Antonio Don, hoo-än′ än-tō′nē-ō dōn lyō-rän′tā, Spanish historian: b. Rincon de Soto, Andalusia, 30 March 1756; d. Madrid 5 Feb. 1823. He studied theology at Tarragona and Madrid, was ordained priest in 1770; was doctor in canon law, chancellor of the University of Toledo; was commissary of the Inquisition at Logrono in 1785, and general secretary of the Inquisition at Madrid in 1789. He was commissioned in 1793 to draw up plans for a general reform of the procedure of the court. His greatest work is the 'Critical History of the Spanish Inquisition' (1815–17), which, however, has no authoritative standing among scholars. He wrote also 'Memoirs Relating to the History of the Spanish Revolution' (1815–19).

Lloyd, loid, **Charles Harford**, English musician: b. Thornbury, Gloucestershire, 1849. He displayed musical talent early, and at 10 was organist of Rangeworthy Church, and after 1862 studied music with Barrett of Bristol, confining his attention almost entirely to Bach and Beethoven. He was graduated from Oxford, where he came under the influence of Stainer, and definitely determined to make music his calling. He conducted the Gloucester musical festivals of 1877 and 1880, was organist of Gloucester cathedral in 1876 and of Oxford cathedral in 1882. Since 1892 he has been precentor and musical instructor at Eton. Among important compositions of his are the cantatas of 'Hero and Leander'; 'The Song of Balder'; 'Andromeda'; 'Alcestis'; 'Song of Judgment'; 'Longbeard's Saga.' He has also written many canticles and anthems for the church, glees, madrigals, and part songs, choruses, etc., and several instrumental pieces.

Lloyd, Curtis Gates, American mycologist: b. Florence, Ky., 17 July 1859. One of the founders of the Lloyd Library and collector of one of the most complete mycological museums in America. He is author of a series of bulletins on 'Mycological Notes'; and co-author of 'Drugs and Medicines of North America.' Mr. Lloyd has done much toward correcting existing errors respecting mycological species.

Lloyd, loid, **David Demarest**, American playwright: b. New York 1851; d. Weehawken, N. J., 1889. He was a brother of H. D. Lloyd (q.v.). He was graduated at the College of New York, and became a member of the staff of the New York *Tribune*. As a correspondent at Albany in 1875 he was prominent in exposing the canal ring. He was the author of four plays: 'For Congress' (1883); 'The Woman Hater' (1885); 'The Dominie's Daughter' (1887); 'The Senator' (1889).

Lloyd, Henry Demarest, American writer on economics: b. New York 1 May 1847; d. 28 Sept. 1903. He was graduated from Columbia University; lectured on political economy in New York schools; studied law, and was admitted to the bar in 1869. In 1872 he went to Chicago, where he was employed on the Chicago *Tribune* till 1885, the latter part of the time as a member of the editorial staff. His later life was devoted to writing. His publications include: 'A Strike of Millionaires against Miners, the Story of Spring Valley' (1890); 'Wealth against Commonwealth' (1894), a history of the growth and methods of the Standard Oil Company; 'Labor Copartnership' (1899), notes of visits to various co-operative shops and farms in Great Britain; 'A Country without Strikes' (1900), an account of the history and workings of compulsory arbitration in New Zealand; and 'Newest England' (1900). He made the labor question his special field of research, and was an advocate of co-operation and a believer in socialistic — or, as he called it, democratic — control of industry, to which he maintained that social evolution was leading. He possessed the power of presenting economic facts in an unusually interesting manner, especially his 'Wealth against Commonwealth,' though compiled from court records and other official documents, is written with a force and vividness which give it real literary quality.

Lloyd, John Uri, American chemist and author: b. West Bloomfield, N. Y., 19 April 1849. He was educated in private schools; became professor of pharmacy at the Cincinnati College of Pharmacy, and held that position till 1887. He has been professor of chemistry in the Eclectic Medical Institute since 1878, and is now its president; and is associate editor of the 'Pharmaceutical Review,' the 'Eclectic Medical Journal,' and the 'Medical Gleaner.' He has made special studies in the dialect, superstitions, and folk-lore of northern Kentucky, is a member of many societies, contributor to chemical and pharmaceutical journals, and has written: 'Chemistry of Medicine' (1881); 'Etidorpha, the End of the Earth' (1895); 'The Right Side of the Car' (1897); 'Stringtown on the Pike' (1900); 'Warwick of the Knobs' (1901); 'Red Head' (1903); and, in collaboration, 'Drugs and Medicines of North America' (1884); 'King's American Dispensatory,' with King (1885–1900); 'Elixirs, their History and Preparation' (1892); 'A Study in Pharmacy' (1895).

Lloyd, Nelson McAllister, American journalist and author: b. Philadelphia 18 Dec. 1873. He was educated at the Germantown Academy, and graduated in electrical engineering at the Pennsylvania State College in 1892. Since then he has been engaged in newspaper work on the New York *Evening Sun*, of which he has been city editor since 1897. He has contributed many historical sketches and short stories to magazines, and has also published 'The Chronic Loafer' (1900); and 'A Drone and a Dreamer' (1901).

Lloyd's, an incorporated firm engaged in marine insurance in London, or otherwise connected with shipping, having rooms in the London Royal Exchange. Members are admitted by subscription, and the affairs of the institution are conducted by a committee. Reports are received daily from all foreign ports, and this information is posted in the common or merchants' room. Besides this, there are other rooms for the use of the underwriters and for ship-auctions, a library, restaurant, etc. Lloyd's list, containing shipping reports, is published daily, and various other publications relating to shipping are also issued. Lloyd's Registry is an independent association for the classification of shipping according to character and efficiency. Lloyd's Register of Shipping is issued annually, and the society maintains a large staff of surveyers, who inspect and report upon vessels both when built and afterward. Originally the London underwriters met at Lloyd's Coffee-house, hence the name.

Lloyd's Bonds, in England, from 1850 to 1870 a well known commercial security; mostly instruments under the seal of a railway or other such company admitting the indebtedness of the company to a specified amount, with a covenant to pay such amount with interest within a stated time. These companies had generally statutory authority to borrow only when a certain amount (usually the whole) of their capital had been subscribed and a specified portion paid up; their power of borrowing must also be exercised with the sanction of a general meeting. Such restrictions were severely felt by companies whose works were being constructed. A barrister, J. H. Lloyd, relieved the companies from this embarrassment by taking advantage of the fact that companies, though prevented in such cases from borrowing, could contract debts in any other way, and acknowledge their obligations in various forms. He introduced a form in which such acknowledgments would become almost as binding on the grantors as a statutory debenture, and so become sufficiently marketable.

Load Line, a line drawn upon the side of a ship to indicate when she is properly loaded, or if overloaded. This is quite essential, as many vessels are lost at sea, the result of overloading. The abbreviations used in designating the load line are as follows:

FW., fresh water load-line (steamer).
IS., summer load-line, Indian Ocean.
S., summer.
W., winter.
WNA., winter, north Atlantic.
F., fresh water sailing ships.

These marks are painted on iron or steel ships, and cut into the wood on wooden vessels.

Loadstar. See LODESTAR.

Loan, anything lent or given to another on condition of return or payment. In law loans are considered to be of two kinds — *mutuum* and *commodate;* the former term being applied to the loan of such articles as are consumed in the use, as provisions or money; the latter to the loan of such articles as must be individually returned to the lender. The acknowledgment of a loan of money may be made by giving a bond, a promissory note, or an I. O. U. (q.v.).

Lobachevsky, or **Lobatchewsky, Nicolas Ivanovitch,** Russian mathematician: b. Makareif, Nyni-Novgorod, 1793; d. 24 Feb. 1856. He entered the University of Kazañ in 1807, completed his course of study in 5 years, became assistant professor of mathematics in 1814, and extraordinary professor in 1816. In 1823 he became ordinary professor and retained the chair until 1846, when he fell into disfavor. Unlike many professional men, he was a good business man and his administration of the affairs of the university was marked by many beneficial changes. He organized the force of teachers, and even studied architecture, so that when the new buildings were erected he supervised their erection, economized space and saved thousands of dollars. He wrote his Pangéometrie in 1855, giving the result of his long years of geometrical studies and presented it to the university. He was one of the first thinkers to apply a critical treatment to the Euclidean principles of geometry. He gave his first contribution to the theory of hyper-geometry in a lecture at Kazañ in 1826, but later wrote several treatises on the subject. He also wrote a treatise on Algebra (Kazañ 1834) and contributed many other articles on mathematics. His complete works were edited by Janischevsky (1870) and have been translated by several writers. His collection of geometrical writings was published in Lanzañ in 1883, the first volume containing Russian articles only, and the second and last volume containing the French and German articles. For his geometry consult: 'New Principles of Geometry with Complete Theory of Parallels,' translated by Halsted (Austin, Texas, 1897).

Lobby, The, a class of persons who seek to influence legislation outside of the regular legislature. The term was originally applied to the waiting-rooms of legislative halls, and then to those persons who frequented these rooms for the purpose of interviewing legislators with a view to influencing their votes. The lobby includes both those who are regularly employed in the work, and those who on particular occasions wish to promote or oppose some specific legislation. All large corporations and firms have regular paid lobbyists at Washington and at State capitals where legislation is likely to affect their interests. Women as well as men are employed as lobbyists, and are said to be very successful. The lobby is not in theory, nor necessarily in practice, a corrupting agency. It may furnish an entirely legitimate and desirable method of giving legislators necessary information in regard to certain laws; but it may also be, and often is, the means of obtaining legislation in the interests of a few without regard to the public good. The methods of the lobby differ with the character of the lobbyist and of the legislator approached. They vary from the legitimate presentation of facts and argument in regard to a law to the use of bribery, threats of preventing re-election, etc.; and include the obtaining of letters and petitions from constituents, the employment of press articles, and social attentions. The successful lobbyist must thoroughly understand the men with whom he has to deal and the methods of legislation; it has been found, therefore, that former members of the legislature make the most successful and sometimes the most dangerous lobbyists. The dangers of the lobby are due to three chief causes: (1) the large number of special and private bills, all of which can not be fully considered at the regular sessions; (2) the system of referring all bills to committees, and accepting, as a rule, the report of the committee, so that the lobbyist has practically but few men to deal with; (3) the secrecy which attends the work of the lobby, giving the public no effective means of knowing or dealing with its evils. To oppose the grosser evils of the lobby both Federal and State laws attach heavy penalties to giving or taking a bribe for legislation. Many of the States also have lessened the number of bills to be presented by forbidding in their constitutions the passing of special acts in certain cases. Massachusetts has sought to lessen the secrecy by requiring every promoter of a law in the interest of others to be registered, with the name and address of his employer and a statement of the matter on which he is employed. This law has had the effect of giving legal sanction to the lobbyist's work, improving the character of the lobbyists, and of lessening, though not entirely preventing, the evils attending secrecy.

Consult: Bryce, ‘American Commonwealth’; Bridgman, ‘The Lobby’ (in ‘New England Magazine,’ n. s. Vol. XVI., p. 151); Tanner, ‘The Lobby and Public Men.’

Lobe'lia, a genus of annual and perennial herbs and a few sub-shrubs of the order Lobeliaceæ, closely allied to the harebells. More than 200 species are distributed throughout the temperate and tropical zones, especially in damp soils. They are characterized by alternate, usually narrow leaves and two-lipped tubular flowers (three petals forming one lip and two the other), arranged in terminal racemes. Several of the species are highly prized as garden plants, the best known being the cardinal-flower (q.v.), the great lobelia (*L. syphilatica*), both common natives in marshy grounds and along streams; *L. erinus,* a favorite African plant for edging flower beds; and *L. fulgens,* a Mexican species, which like the first named has brilliant red flowers. The other two generally have blue blossoms. They are all of simplest culture. Some species have been used in medicine, and one common species, *L. inflata,* is called Indian tobacco because its dried leaves were extensively smoked by the southern Indians, who enjoyed the narcotic effect in spite of the bitter flavor. Lobelin, lobelacrin and lobelic acid are organic derivatives.

Lobengula, lō-bĕng-goo'lä, king of the Matabeles (see Matabeleland): b. about 1833; d. 1894. He was a son of Mosilikatse, whom he succeeded in 1870. Fixing his capital at Bulawayo (q.v.), he made himself a powerful opponent of Western civilization, and prohibited his people, on pain of death, from accepting Christianity. After years of diplomatic effort, following the discovery of gold in his domains, Great Britain, by treaty in 1888, acquired suzerainty over his kingdom, and in 1890 the British South African Company obtained from him permission to settle in Mashonaland (q.v.), paying him a stipulated rent. After preparing to hold the country and work the gold mines, the company provoked the enmity of Lobengula, who began against the English a war which resulted in his disastrous defeat, after shocking slaughter of his men by Maxim guns. Bulawayo was taken, and Lobengula fled. During his flight he ambuscaded and killed Maj. Wilson and a British detachment, but the contest ended with his own death.

Lob'lolly Bay, or **Tan Bay,** an elegant pyramidal shrub or tree (*Gordonia lasianthus*) of the tea family, which covers considerable tracts of swampy coast along the Gulf of Mexico. It is a handsome tree, sometimes 50 or 60 feet tall, with evergreen leaves and large white fragrant flowers. Its bark is used in tanning.

Loboc, lō-bŏk', Philippines, a pueblo of the province of Bohol, situated in the southern part of the province on the Socar-Vilar-Loay River, three miles from its outlet, and 12 miles east of Tagbilaran, the provincial capital. It is on the road leading from the coast. Pop. 10,200.

Lobos, lō'bōs, or **Seal Islands,** Peru, three islands in the Pacific, 12 miles from the mainland, so named from the Spanish *lobo,* "seal," large numbers frequenting the islands. They were famous for their extensive deposits of guano, which have been depleted.

Lob'ster, the name of certain large crustaceans of the crab group, and especially of the genera *Homarus, Nephrops,* and *Palinurus.* To the first belong the common European and American lobsters (*Homarus gammarus* and *americanus*). *Nephrops* differs chiefly in possessing 19, instead of 20, pairs of gills, and its most important species is the Norwegian lobster (*N. norvegicus*). To *Palinurus* belongs the rock-lobster or marine crayfish (*P. vulgaris*) of Europe, as well as some tropical species, all of which differ from the common lobster in the absence of the large claws, while they possess long rigid antennæ and spiny shells. A large and handsome species of this group is abundant in West Indian waters.

The American lobster is found along the western Atlantic coast from Delaware to Labrador; from the shore to a depth of 100 fathoms. It is most abundant on the shores of Maine and Nova Scotia and uncommon on the New Jersey coast. Though living amid a variety of surroundings, the lobster prefers rocky bottoms, on which it reaches the greatest size and abundance, probably a direct result of a more plentiful food supply. Like many fishes, but to a much less degree, the lobster is migratory, moving into shallow water in the spring and returning to greater depths as the water grows colder in the fall. This habit, however, is very far from being universal and many lobsters remain in shallow waters throughout the year. The food of the lobster consists of all kinds of animals, both living and dead, and to a less extent of vegetable matter, the indigestible parts of which are regurgitated. At times they are cannibalistic. Although so well protected by their hard shells, powerful claws, and burrowing habits, lobsters have many enemies besides man. The most important of these are bottom-feeding fishes, such as the cod, tautog, skate and dogfish, which destroy great numbers of young lobsters when 2 to 6 inches long, as well as the egg-bearing females and moulting adults. During the free-swimming larval stages great numbers probably fall a prey to surface-feeding fishes like the menhaden and herring, though little direct proof of this exists. The number of eggs produced by a female lobster varies from 3,000 to nearly 100,000, according to the size and age of the animal, maturity being attained at an age of 3 or 4 years and a length of about 8 to 12 inches. The great majority (about four fifths) lay their eggs during the summer, the remainder during the fall and winter, and it is probable that each female lays once in two years. After extrusion the eggs are borne on the appendages attached to the lower side of the abdomen or tail of the female, where they remain undergoing a slow development for 10 or 11 months, most of those laid during the summer hatching in June of the following year. After hatching, the young passes a period of 6 to 8 weeks as a free-swimming pelagic larva, which moults 5 or 6 times, with corresponding changes in form and color. By this time it has assumed the form of the adult and is about three fourths of an inch long. It now sinks to the bottom and burrows into the gravel or hides in rock crevices near shore. At the end of the first year it is about 4 or 5 inches long and has moulted from 14 to 17 times, after which growth is much less rapid and moulting less frequent. The rate of growth varies greatly according to the food supply and other conditions, but a lobster of 10 or 12 inches is about 5 years old. A great age and size are sometimes attained, individuals weighing upward of 40 pounds being recorded, though even 25 pounds is very rarely reached.

The toothsomeness of the American lobster was early recognized and a regular fishery has existed on the Massachusetts coast for nearly a century. Owing to a rapidly extending depletion of the fishing-grounds and a consequent diminution in the size and number of lobsters, the centre of the fishery has shifted northward, first to Maine and then to the British provinces. The lobster fisheries of the United States in 1901 employed 4,348 persons, 4,151 vessels and boats and 208,563 lobster-pots, representing an investment of $1,668,060, nearly three fifths of which is credited to Maine. The yield was 15,767,741 pounds, valued at $1,390,579, of which 12,346,450 pounds were taken in Maine. After about 1885 the yield declined steadily, but the value of the product increased. As measures toward maintaining the lobster supply, laws have been enacted fixing fines for the possession of egg-bearing lobsters or those below a specified minimum size, and recourse has been had to artificial propagation. In the latter practice many millions of eggs are annually taken from the bearing lobsters, artificially hatched, and the larvæ distributed by the fish commissions of the United States and the British Provinces. In 1902 our Bureau planted upward of 81,000,000 of fry, and the Canadian government operates on an even more extensive scale. The beneficial results have been scarcely apparent, but the recent successful rearing of lobsters beyond the larval stages has introduced a more hopeful outlook. The methods of the lobster fishery are very simple and uniform. Use is made of a trap or pot, a box-like affair generally made of laths placed about one inch apart, and with a funnel-shaped opening of coarse netting placed in one end. The pot is baited with otherwise useless fish, weighted with stones, and lowered to the bottom by means of a rope to the upper end of which a buoy, with the owner's private mark affixed, is attached. The pots are visited daily, and the lobsters, which after entering are unable to find their way out, removed. They are kept alive in floats until a sufficient number for shipment has been gathered. Besides those sold in the shells, large quantities of the meat are canned, particularly at Portland.

Consult especially the elaborate account of the American lobster by Herrick, in ‘Bulletin of the U. S. Fish Commission’ for 1895, in which full bibliographical references will be found.

Lob'worm. See Lugworm.

Local Government. See Municipal Government.

Local Option, or local control of the liquor traffic; a term applied to the principle by which a certain majority of the inhabitants or taxpayers of a certain locality, town, county or State, may decide as to whether any, or how many, places for the sale of intoxicating liquors shall exist in the locality. What considerations should determine a locality, who should be the constituents, what should be the majority necessary to vote the abolition of licenses, and whether the trade thus affected should receive compensation or not, are points not as yet satisfactorily settled. This principle operates in several localities in the United States with varying success from the prohibition or temperance point of view. Local option in the States of Maine and Kansas has resulted in restricted laws governing the liquor traffic. Many small towns and villages have adopted local option with more or less satisfactory results. The words «local option» had their origin with the temperance reformers who have sought to secure power and authority enabling them to regulate the liquor traffic, either by maintaining unchanged, increasing, diminishing, or wholly suppressing the houses for the sale of intoxicating liquors.

Loch Lomond. See Lomond, Loch.

Lochleven. See Leven, Loch.

Lock, a mechanical appliance used for fastening doors, chests, etc., generally opened by a key; or more broadly speaking, a lock is a *bolt* guarded by an *obstacle,* and controlled by a *key.* The *bolt* may be pivoted or rotary, but usually slides; the *key* generally rotates, but may act by sliding or pushing; the *obstacle,* which in order to operate the bolt must be overcome by the key, may be of the *warded* (fixed) or of the *tumbler* (movable) types.

History.— The history of the art of the locksmith is probably as old as the history of civilization, and references to it are found in the early literature of every nation. Wood was undoubtedly the first material used in construction, but the Egyptians appear to have, at an early date, employed brass and iron also. The Hebrews and Greeks used crooked keys, with ivory or wooden handles, for the purpose of bolting or unbolting doors. Some of the modern Greeks still employ the primitive method of closing doors from the inside by a wooden or metallic bar, attached to the door by means of leather strings or small iron chains; wood or iron keys, made in the shape of hooks were inserted through a hole in the door and by turning lifted up the bar on the inside. The similarity of these primitive locks rendered access to the house easy and soon led to an improvement upon the method, resulting in the so-called Lacedæmonian lock. This too was improved, but of the workings of this lock no description has come down to us.

Among the nations of antiquity lock-making made little progress in advance of what had been done by the Egyptians. Even the Romans, who excelled the other nations of the world in iron-work, used very simple locks, resembling those of the modern Greek. The *tumbler* lock was next in succession, and was probably first invented and used by the Chinese. In this lock a lever or slide entered a notch in the bolt, which could not be moved till the tumbler was lifted by the key. The *warded* lock, used by the Etruscans, was the next form of lock which came into general use. While the Roman locks belong to the same description, they were distinctly different. In locking and unlocking the keys did not make a complete revolution and consequently were identical with the spring locks of modern days. After the downfall of the Roman Empire, lock-making took on an unprecedented impulse, owing to the increased danger of robbery, and human ingenuity was taxed to the limit to provide means for the safe-keeping of valuables. About 1650 a fourth type of lock, the *letter* or *dial* lock, was invented by M. Regnier, director of the Musée d'Artillerie at Paris, and these four types form the basis for the majority of our modern locks.

Locks were first manufactured in England during the reign of Alfred (A.D. 871–901), but no substantial improvement in their construction was made till the latter part of the 18th century. These improved locks were the Barron, first patented in 1778, the Bramah lock, patented in 1784; these were followed in 1818 by the Chubb, and later by the American Parautopic lock of Dav & Newell. Of those then manufactured, this latter lock became the most generally used for safes because it presented the least possibility of being picked, but this lock finally succumbed to the skill of Linas Yale, Jr., an American inventor (b. 1821; d. 1868). Yale had for a number of years been interested in and had patented locks of diverse types and ingenious construction. The modern combination lock was then unknown, and Yale's earlier inventions related to locks operated by keys, but great security was obtained by making the "bit" of the key changeable at will and also detachable from the handle, so that, as the latter was rotated in the lock, the former was detached and carried away from the keyhole to a remote part of the lock, and there brought into contact with the tumblers to set them in position to permit the bolt to move, the continued rotation of the key handle then operating the bolt and returning the "bit" to the key-hole for removal. Yale then perfected the *dial* lock, the improved form of which is now in universal use in America for safes and vaults, and which, as now made, is proof against picking by any methods thus far discovered.

Mr. Yale's most important invention, brought out in 1860 to 1864, was the key lock universally known as the *Yale* lock, the United States patents for which were issued on 29 Jan. 1861, and 27 June 1865. This combination of a flat key and revolving "plug" has almost entirely superseded the crude and bulky lock, of indifferent security and inferior workmanship, which was opened by a round key, and the introduction of the Yale or cylinder type completely revolutionized the art of lock-making in America.

Yale's inventions led to the dial lock of James Sargent, but as the user of both of these, the Yale and the Sargent, could be coerced to open them, the inventors turned their attention to making the only lock which is absolutely unassailable — the *time-lock*. This was first suggested in 1831 by an Englishman, William Rutherford; in 1857 Holbrook & Fish of the United States devised another, but the first successful time-locks put on the market were the Sargent and Yale time-locks, brought out in 1875, and followed later by the Pillard, the Homes, the Hall, and others.

Warded Locks.— In the majority of this class there is a "back spring" or dog, the feeling of which, when using the key, resembles that of a tumbler, but which adds nothing to the security.

Lever Tumbler Locks.—These locks may contain several tumblers, the number of key changes usually being limited to from 12 to 24 and possibly 72, while in a good three-tumbler lock of this style as many as from 200 to 500 key-changes are possible. Round, barrel, and flat keys are used.

Cylinder and "Pin-Tumbler" Locks.— The former term applies to locks in which the pin tumbler is contained in a cylinder separate from the lock case; the latter is applied to those wherein the pin tumblers are contained in the lock itself.

Master-Keyed Locks.—A series of locks is said to be "master-keyed" when so constructed that each lock can be operated by its own key, which fits no other lock of the series, and also by another key which will operate every lock in the entire series. Warded locks are master-keyed by means of a "skeleton" key, with the bit cut away sufficiently to avoid all the wards in all of the locks of the series. Lever-tumbler locks are master-keyed in three ways, either by providing two "gatings" on each tumbler, one of which is brought in line with the corresponding "fence" or post on the bolt by the change-key and the other by the master-key; by providing a "lifter," which, when actuated by the master-key, moves the tumblers in the same manner as does the change-key when the latter acts directly on the tumblers; or by providing a set of secondary levers, which, when operated by the master-key, move the primary tumblers in the same manner as the change-key which acts on them directly. Pin-tumbler locks are master-keyed by cutting each pin in two places, or by encircling the plug (which contains the key-way) with a larger annular plug, thus providing two points at which each tumbler may be set to permit the plug to rotate, and utilizing one set of these points for the change-key and the other set for the master-key.

Time or Chronometer Locks.— In these the mechanism is actuated by clock-work, and is used, in connection with the heavy bolt work of a safe door, to prevent the unlocking of the latter except upon the hour at which the clock is set. There are generally three chronometer movements, each of which will of itself actuate the lock, so that should one or two be disabled or inoperative, the other will open the door at the time indicated. In connection with the time lock an automatic bolt operating device is often used.

Dial or Combination Locks.— These consist essentially of a bolting mechanism guarded by a set of changeable tumblers or wheels, and actuated by a spindle passing through the door, provided on the outer end with a graduated dial, by rotating which in a certain manner the tumblers can be set and the lock be operated.

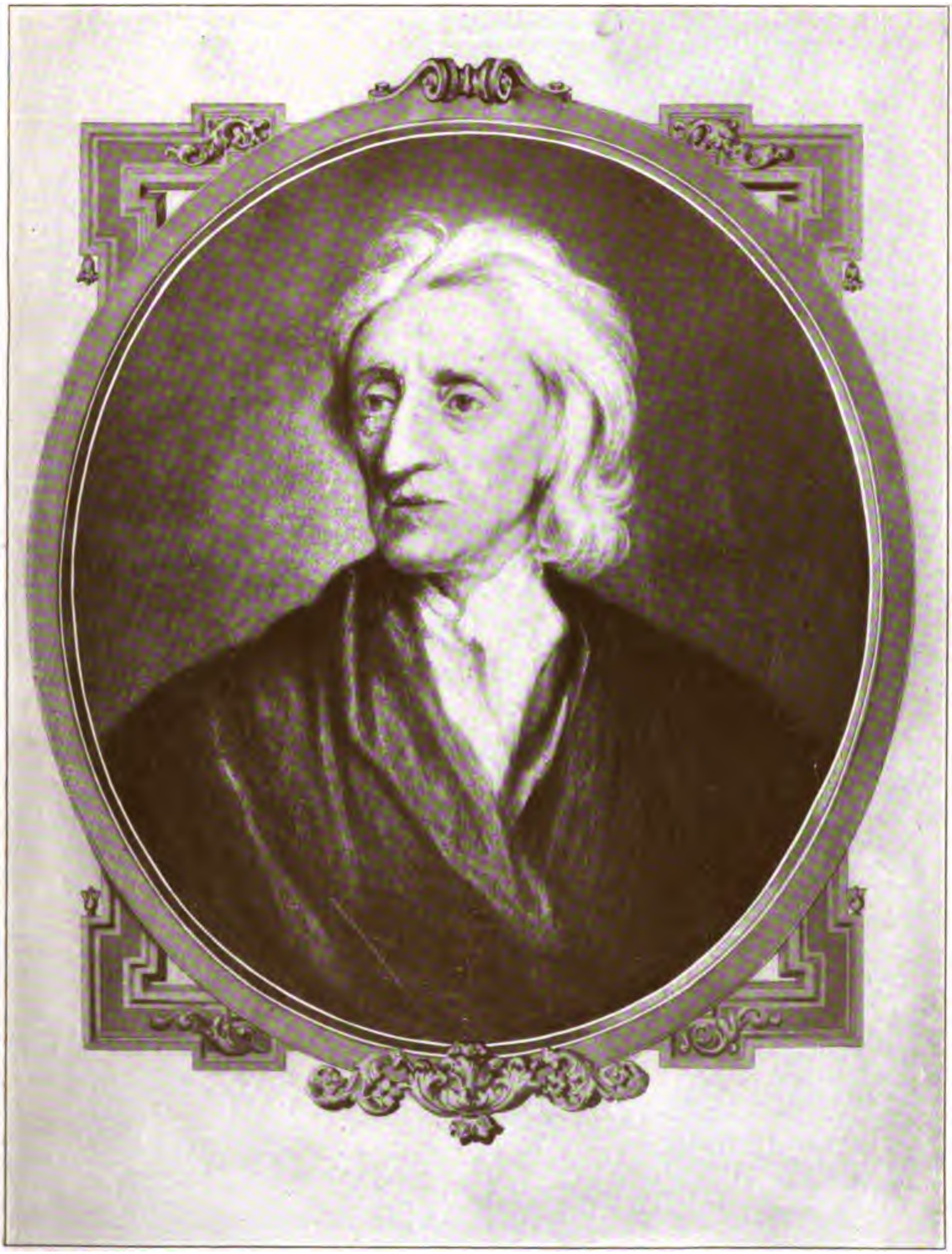
Lock-Making.— The first locks made in this country naturally were patterned after those made in Europe, but whereas the European artisan used wrought metal in construction, the American manufacturers soon turned from this and employed cast metal. This change, together with the introduction of vastly improved machinery, soon reduced the cost of production, so that now locks of the best type can be purchased at a merely nominal cost, and while, for a few years after 1870, the sharp competition among manufacturers tended to reduce the quality of the production, the mechanical advancement since that time has been marked and at the present time the highest grade of workmanship and mechanical skill is manifest in the articles on the American market.

Lock Haven, Pa., city, county-seat of Clinton County; on the Susquehanna River and on branches of the Beech Creek and the Pennsylvania R.R.'s; about 68 miles northwest of Harrisburg. The first settlement was made in 1769 and, in 1833, it was incorporated as a town. In 1844 it was made a borough, and in 1870 received its city charter. It is situated in an agricultural and lumbering region. Its chief industrial establishments are lumber and planing-mills, tanneries, cigar-box factory, cigar factory, foundries, sewer-pipe works, fire-brick works, silk-mill, breweries, paper-mill, and furniture factory. The State Central Normal School is situated here. Some of the prominent buildings are the court-house, a hospital, and several of the churches. The city has a circulating library containing about 6,000 volumes. Pop. (1910) 7,772.

Locke, lŏk, **David Ross** («Petroleum V. Nasby»), American humorist and satirist: b. Vestal, Broome County, N. Y., 20 Sept. 1833; d. Toledo, Ohio, 15 Feb. 1888. He learned the trade of printer and after being connected with several newspapers was editor and owner of the Toledo *Blade* in 1865, and very soon became popular as a humorous writer and later as a lecturer. He began his «Nasby» letters in the Findlay 'Jeffersonian' in 1860 and continued them throughout the Civil War. They exercised much influence in molding popular opinion, upholding as they did the policy of the Lincoln administration. In later years the satire of the letters, which still continued to appear, was aimed at President Johnson and his peculiar methods. They were collected and published in book form under the titles 'Divers Views, Opinions, and Prophecies of Yours Truly' (1865); 'Swingin' Round the Kirkle' (1866); 'Ekkoes from Kentucky' (1867); 'The Struggles — Social, Financial, and Political — of P. V. Nasby' (1872). He also published 'Hannah Jane'; 'The Moral History of America's Life Struggle'; 'The Morals of Abou Ben Adhem.'

Locke, John, English philosopher: b. Wrington, Somerset, 29 Aug. 1632; d. Oates, Essex, 28 Oct. 1704. He was the son of an attorney who was also a captain in the Parliamentary army. Locke was educated at Westminster School and at Christ Church, Oxford, where he was graduated and took his bachelor's degree in 1656, two years later took the degree of M. A., and entered upon the study of medicine. He lectured at Oxford (1661–4) on Greek, rhetoric, and philosophy, and during this period became interested in experimental physics, especially chemistry and meteorology, and in metaphysics showed a preference for studying Descartes, although his own philosophy powerfully antagonizes that of the French master. Theology and politics, including diplomacy, also engaged his attention. At Oxford before 1666 he is said to have practised medicine, in which, however, he was never graduated. As secretary to Sir Walter Vane, British envoy, he went in 1665 to Cleves, Prussia, returning to Oxford in the following year, during which time he made the acquaintance of Lord Ashley, afterward 1st Earl of Shaftesbury, became his family physician and secretary, under his patronage held various offices, and in 1682 accompanied him in his retirement to Holland. Locke continued to reside abroad until 1689, when the revolution had been accomplished, then returned to become commissioner of appeals. His association with Lord Ashley, between whom and himself there was close intellectual sympathy, was stimulating to his genius, and it was in Ashley's house that Locke first planned the 'Essay on the Human Understanding.' Fully elaborating this work during his voluntary exile, he published it in complete form in 1690, with a dedication to the Earl of Pembroke, whose acquaintance he had made at Montpellier many years before. The 'Essay,' which had largely occupied him for almost 20 years, met with much objection in England, being particularly opposed at Oxford; but on the Continent it brought him great celebrity, and was translated into French and Latin, and later into other languages. For the copyright of the first edition he received but £30, and although he had previously published two works this was the first to bear the author's name. In 1695 Locke was made a commissioner of trade and plantations, but in a few years became incapacitated and retired, and from 1700 until his death lived with his friend, Sir F. Masham, at Oates. Meanwhile being drawn into the violent controversies over the essay which arose among different sects and schools, he had sturdily maintained his ground in a style of epistolary polemics which still possesses an academic interest.

As a philosopher Locke's place is usually fixed at the head of the English Sensational School, although this classification by no means does justice to his many-sidedness as a thinker, and the term «sensationalism,» with its ordinary connotations, is wholly inadequate for a correct representation either of his speculative inquiries or of those still less definable meditations which led him profoundly to search the realms of ethics and of spiritual laws, in an endeavor to assign the relations and functions of these in the world of practical politics and that of instituted religion. Of that sensationalist school of which he is reputed to have been founder, it has been said with much pertinence that its ultimate conclusions are such as «his calm and pious mind would have indignantly repudiated.» The 'Essay on the Human Understanding' holds a permanent place among the greater works of philosophy, in the history of which, however, Locke's method may be superseded, and although his main doctrine be exploded, the book retains its importance as an epoch-marking achievement. It seeks the primal sources and the scope of human knowledge, denying the existence of innate ideas, presenting the mind as a sheet of white paper prepared to



JOHN LOCKE.

be written upon by experience, which alone supplies the knowledge there impressed, and tracing the sources of all ideas to what he calls sensation and reflection. This doctrine of the *tabula rasa* or white paper found a vigorous controverter in Leibnitz (q.v.). The opposition which Locke thus represented between all intuitional and experiential philosophies still remains a central point of dispute among thinkers of various schools, but he was a forerunner in psychology, as he was also in the advocacy of civil and religious liberty, for which he suffered persecution and betook himself to exile.

Upon questions of government Locke was in the main a follower of Hobbes (q.v.) in so far as the latter regarded governmental authority as something delegated by the subjects for the creation of the state, through a compact which carried in itself the principle of obligation. But he went far beyond Hobbes in the application of his views to the concrete affairs of politics. In 1689 a constitution for the Carolina colonists was drafted by him, and was an evidence of his concern to put political philosophy to practical service. Besides the 'Essay,' his works include letters 'Concerning Toleration' (1689); 'Two Treatises on Government' (1690); 'Some Thoughts Concerning Education' (1693); 'The Reasonableness of Christianity'; and a little book 'On the Conduct of the Understanding,' posthumously published. Frazer's edition of the 'Essay' (1894) is the most desirable. His philosophical writings have been published in various editions, Saint John's (1854 et seq.) being one of the most useful. Consult: King, 'The Life of John Locke' (1829); Fox Bourne, 'The Life of John Locke' (1876); Fowler, 'John Locke' (1880); Frazer, 'Locke' (1890); Russell, 'The Philosophy of Locke' (1891); and Ueberweg-Heinze, 'Grundriss der Geschichte der Philosophie' (8th ed., 1896), where a more extended bibliography is to be found.

Locke, William John, English novelist: b. 20 March 1863. He was educated at Queen's Royal College, Trinidad, and Cambridge University, and is now (1903) secretary of the Royal Institute of British Architects. His fictions include 'At the Gate of Samaria' (1895); 'The Demagogue and Lady Phayre' (1896); 'A Study in Shadows' (1896); 'Derelicts' (1897); 'Idols' (1898); 'The White Dove' (1900); 'The Glory of Clementina' (1911). These have been reissued in the United States. He has also written two plays, 'Mr. Cynic,' played in 1899, and 'The Lost Legion' (1900).

Lock'er-Lamp'son, Frederick, English lyric poet: b. Greenwich 29 May 1821; d. Rowfant, England, 30 May 1895. He wrote a volume of "society verses" greatly admired for their grace and finish, 'London Lyrics' (1857); edited an anthology, 'Lyra Elegantiarum' (1867); and wrote a collection of miscellanies entitled 'Patchwork' (1879). In 1874 he married for his second wife the daughter of Sir Curtis Lampson and took her name in addition to his own. Consult 'My Confidences,' his autobiography (1896).

Lockhart, lŏk'ärt, **John Gibson,** Scottish editor and biographer: b. Cambusnethan, Lanarkshire, 14 July 1794; d. Abbotsford 25 Nov. 1854. He was graduated at Glasgow and Oxford universities and became a member of the Scottish bar. He never practised as an advocate, but devoted his time to literary pursuits. In 1817, with Professor Wilson, he established 'Blackwood's Magazine,' a Tory organ, which at the outset created an immense sensation by the ability and keen satire displayed in many of its articles. In 1820 Lockhart, who had previously become a favorite with Sir Walter Scott, married his eldest daughter, and much of his future life took its color from this connection. In 1826 he succeeded Gifford in the editorship of the 'Quarterly Review,' and continued in the position till 1853. His translations of 'Spanish Ballads,' originally contributed to 'Blackwood,' were collected in 1823. He also published the novel 'Valcrius' (1821); 'Reginald Dalton' (1823); 'Adam Blair' (1822); and 'Matthew Wald' (1824); 'Life of Robert Burns' (1828); 'Life of Sir Walter Scott' (1839–41). This last, though indebted for much of its interest to its subject, is on the whole written, notwithstanding occasional prolixity, with taste and judgment. Lockhart, for his steady attachment and important services to the Conservative party, was rewarded in 1843, by Sir Robert Peel, with the appointment of auditor of the duchy of Lancaster. He was buried in Dryburgh Abbey, close by Sir Walter Scott. Consult: Lang, 'Life of John Gibson Lockhart' (1896).

Lockhart, lŏk'härt, Texas, town, county-seat of Caldwell County; on the Missouri, K. & T., and the San Antonio & A. P. R.R.'s; about 28 miles south of Austin and 140 miles west of Houston. It is situated in a fertile agricultural section in which cotton and live-stock are raised extensively. Some of its industrial establishments are a soap-factory, cotton-gins, cottonseed-oil mill, wagon and carriage factory, cotton-compress, stock-yards, grain-elevators, and lumber-yard. Pop. (1910) 2,945.

Lockjaw. See TETANUS.

Lock'out, the discharge and keeping out of employment of artisans and laborers by their employers. It is a retaliatory measure adopted by some capitalists to resist the demands for shorter hours, more pay, etc., made by their workmen. The workmen may themselves be responsible for a lockout, just as an employer may be responsible for a strike upon the part of his workmen. See also STRIKES.

Lock'port, N. Y., city, county-seat of Niagara County; on the Erie Canal, and on the Erie, the Buffalo & L., and the New York C. R.R.'s; 12 miles from Lake Ontario, 20 miles east of Niagara Falls, and about 25 miles north by east of Buffalo. It was settled in 1823 by workmen who were employed on the Erie Canal. On 26 March 1829 it was incorporated as a village, and became a city 11 April 1865. It is situated in a fertile agricultural region; but the extensive water-power obtained from the canal has made it an important manufacturing city. The 10 large locks of the canal, which here make a descent of 66 feet, have given name to the city. The canal passes through a deep cut, an excavation in the solid rock, several miles in length. The New York Central Railroad bridge, 500 feet long, crosses the canal here, at a height of 60 feet above water. There are large sandstone and limestone quarries in the vicinity.

The chief manufactures are pulp and paper, Holly waterworks machinery, wood-work machinery, machinery for flour mills, glass, rolling-mill products, cotton-batting, wagons and carriages, brooms, flour, indurated fibre, aluminum, cotton and woolen goods, and creamery products. Lockport has 20 large manufacturing establishments, which have nearly 12,000 employees. In addition to the trade in manufactured articles, the city has an extensive trade in the quarry products, and in grain and fruits. It maintains four banks, with a combined capital of $3,500,000. Some of the prominent buildings are the high school, the new government building, and the court-house. It has 19 churches and good public and parish schools. It is the seat of Saint Joseph's Academy. The city owns and operates the waterworks. The government is vested in a mayor and a council of 10 members, elected annually. Pop. (1910) 17,970. Consult Pool, ‘Landmarks of Niagara County.’

T. T. Feeley,
Editor ‘Review.’

Locks, Canal. See Canals.

Locks'ley Hall, a well-known poem by Lord Alfred Tennyson (q.v.), first published in 1842.

Lock'wood, Belva Ann Bennett, American lawyer and reformer: b. Royalton, N. Y., 24 Oct. 1830. She was graduated from Genesee College, Lima, N. Y., in 1857, and taught school 1857–68. She was married in 1848 to Uriah H. McNall (d. 1853), and in 1868 to Dr. Ezekiel Lockwood. She studied law at Washington, and was admitted to the bar in the District of Columbia in 1873. Before that time she had secured the passage of a bill giving women employees of the government equal pay for equal work; in 1879 she obtained the passage of a bill permitting women to practise before the United States Supreme Court, and was admitted under this law in the same year. She has been engaged in many important law cases, some before the Supreme Court, and was one of the attorneys in the probate of the will of Myra Clarke Gaines. She has also been active in temperance, peace, and women suffrage movements; has been secretary of the American branch of the International Peace Bureau; and in 1884 and 1888 was the nominee of the Equal Rights Party for President of the United States. In 1896 she was commissioned by the Secretary of State to represent the United States at the Congress of Charities and Corrections in Geneva, Switzerland; in 1901 she was elected president of the Women's National Press Association. She has for several years been interested in the claims of the North Carolina Cherokee Indians, and in 1900 had a bill before Congress to prevent encroachment upon their territory. She also prepared an amendment to the Statehood Bill before Congress in 1903, granting suffrage to women in Oklahoma, Arizona, and New Mexico.

Lockwood, James Booth, American soldier and Arctic explorer: b. Annapolis, Md., 9 Oct. 1852; d. Cape Sabine, 9 April 1884. He entered the army as 2d lieutenant in 1873, and served till 1880 in the West. He volunteered to accompany the Lady Franklin Bay expedition to the Arctic regions and was made second in command. His fame rests on the discovery of Lockwood Island, in lat. 83° 24′ N., the farthest northern point of land or sea up to that time. His body was brought to the United States and interred in the grounds of the Naval Academy. Consult Lanman, ‘Farthest North’ (1885).

Lockyer, lŏk'yér, Sir **Joseph Norman,** English astronomer: b. Rugby 17 May 1836. He was educated privately, entered the War Office in 1857, and in 1870 was appointed secretary of the royal commission on the advancement of science. Five years later he became astronomical lecturer at South Kensington, and since 1881 has been professor of astronomical physics in the Royal College of Science. He directed the eclipse expedition to Sicily in 1870, and to India in 1871, and he subsequently directed those in 1882, 1886, 1896, 1898 and 1900. In 1874 he was awarded the Rumford medal of the Royal Society, and became editor of ‘Nature,’ a post which he still holds, and was knighted in 1897. In 1878 he observed the eclipse in the United States; was president of the British Association for the Advancement of Science in 1903–4; and is director of the Solar Physics Observatory at South Kensington. He is best known as a popular lecturer on science, and in connection with his discoveries in spectrum analysis. He has published: ‘Elementary Lessons in Astronomy’ (1870); ‘Contributions to Solar Physics’ (1873); ‘The Spectroscope’ (1873); ‘Primer of Astronomy’ (1874); ‘Studies in Spectrum Analysis’ (1878); ‘Star-Gazing’ (1878); ‘Chemistry of the Sun’ (1887); ‘The Movements of the Earth’ (1887); ‘The Meteoritic Hypothesis’ (1890); ‘The Dawn of Astronomy’ (1894); ‘The Sun's Place in Nature’ (1897); ‘Recent and Coming Eclipses’ (1897); ‘Inorganic Evolution’ (1900); etc.

Loco-Fo'cos, in United States history, a political nickname applied to the equal rights or radical faction, 1835–7, of the Democratic party, properly of New York, though the name was afterward made national. During the Federalist control of the government, the method of granting bank charters and controlling banks was charged by the opposing faction with favoritism and corruption. Upon their gaining control, things did not, in the opinion of many, improve; and in 1835 there was formed in New York the «Equal Rights party,» opposed to special privileges in granting bank charters to corporations. At a meeting in Tammany Hall, 29 Oct. 1835, the regular Tammany Democrats tried to gain control. Finding themselves outnumbered they turned out the lights and retired. The Equal Rights men produced candles and «loco-foco» matches, and continued the meeting. Hence the name. This party was beaten at the elections, but nevertheless exercised considerable influence in national affairs for several years. For a time the name was shortened into «locos.»

Lo'co-weed, or **Loco-vetch.** See Crazy Weed.

Locomo'tion, Animal. See Flight; Swimming.

Locomotive, The. In these highly progressive days of automobiles and rapid flying machines, of telephones and wireless telegraphy, we are too apt to forget what was probably the greatest invention of them all — the locomotive. Yet, it is very questionable whether, considered historically, anything man has ever wrought — whether any triumph of mind over matter — has contributed more to the general progress of the race than the locomotive, which was really the first auto-mobile (that is, *selfpropeller*). It was the first mode of travel that really tended to reduce distances, to make outlying parts at all accessible and available for human habitation, to bring distant sections into closer communion — to make the world *one* in a sense hitherto unknown and undreamed of. It has been in a very real and important sense the moving force in our modern civilization, making human life possible and human effort profitable where otherwise it would have been impossible for man to advance. Its invention and development have added to man's happiness, pleasure, comfort and wealth more than any one thing of human conception. And today throughout the whole civilized world the steam engine is one of the greatest and best of all the agencies for the promotion of human welfare.

To dilate on the commercial advantages made possible by the invention of the locomotive would seem altogether unnecessary, were it not that the eyes of the world are considerably blinded to them owing to many newer and more dazzling inventions. For commerce and transportation, no less than for travel, the locomotive engine is still the «motor par excellence.» City-life, modern farming, road-agents, commuters, and numerous other phases of present-day life and business, were indeed impossible without the pioneer of all great inventions. One could not exaggerate its importance, because its importance cannot be overestimated. The novelty of the locomotive has indeed long worn off, but its utility goes on increasing with every age and generation. But to turn to its history, construction, and manufacture.

Although there were many predictions and suggestions of steam-propelled carriages, notably those of Sir Isaac Newton in 1680 and of others, the first locomotive that deserves the name was that of Richard Trevithick in 1803. True, Cugnot made a steam-driven road wagon in 1769 and Murdock in 1784, but Trevithick was without doubt the father of the locomotive. He found that plain wheels had sufficient adhesion and that cogs were unnecessary; he used high pressure steam; he turned the exhaust into the stack and on discovering its effect on the fire, called it the «blast pipe.» His first engine had four wheels, all drivers, 4 ft. 6 in. in diameter. The boiler was 6 feet long and had a return flue bringing the chimney or stack at the same end as the fire door. There was only one cylinder, but the length made up for two, as it was 8 inches in diameter by 54 inches long. Unfortunately circumstances prevented Trevithick from following up the development of the locomotive and as a consequence many of his ideas have been credited to others. Between Trevithick's engine and the Rocket (1829), which is sometimes called the first locomotive, men had not been idle by any means. Blenkinsop in 1812, Hedley with his Puffing Billy in 1813, Stephenson's Blucher in 1814, Oliver Evans in the same year and others made up the list.

In 1825 the first public railway was opened, the Stockton and Darlington Railway, and George Stephenson was engineer. Its first engine was the Locomotive which was built by Stephenson in 1825. He also built the Hope, Black Diamond, Diligence and Experiment in 1826. Timothy Hackworth's Royal George, a rebuilt engine, went into service in 1827, but none were entirely satisfactory, and a prize of $500 was offered in 1829 for the best engines. The Rocket, Novelty and Sanspareil entered and the Rocket won, although some claim this was due solely to the failure of the others, caused by poor work or material. This was the famous Rainhill trial which is so often quoted, and in which 29 miles per hour was made. The main dimensions of the Rocket were:

Cylinders, 8 x 16½.
One pair drivers, 3 ft. 8½ in.
Boiler, 3 ft. 4 in. diameter, by 6 ft. long.
Steam, 50 lbs.
Firebox, 3 by 2 ft.
Tubes, 23 three-inch.
Tubes, H. S., 117.75.
Firebox, H. S., 20.
Total, H. S., 137.75.
Weight of engine, 4 tons 5 cwt.

This trial proved the success of the locomotive as a means of hauling loads, and this is probably the main reason that Stephenson has been given credit which belonged to others. In 1828 Horatio Allen went to England for the Delaware and Hudson Canal Co. and bought four locomotives, three from Foster, Rastrick & Co. and one from Stephenson. Stephenson's engine arrived first in January 1829 and was called the America. It had cylinders 9 by 24 inches, a boiler 49 inches in diameter by 9 feet 6 inches long with two fire tubes 19 inches in diameter. The four drivers were 48 inches in diameter, and the cylinders were at an angle of 33 degrees to the horizontal. This engine has a kind of «bar frame.» Although the America arrived in the country first, it was not the first to run and for that reason the Stourbridge Lion, the first of the other three engines, is generally considered as the first engine in this country. This engine had cylinders 7½ by 36 inches. The boiler was 48 inches in diameter by 10 feet long. The reversing was accomplished by shifting eccentrics on the axle. From this date the United States began to take a hand in the development of the locomotive, and foremost at this time was the Baltimore & Ohio Railroad. On 4 Jan. 1831 they offered $4,000 for the best American engine of 3½ tons to pull 15 tons on a level at a 15-mile speed. It must burn anthracite coal, be on four wheels and run on 400 foot radius curves, steam not to exceed 100 pounds. Phineas Davis won the prize with the York, a vertical engine with four 30 inch wheels. Ross Winans was connected with the road as engineer and this experience doubtless aided the work he did in after years as a locomotive builder of no small fame. The «Bury» boiler came into existence in 1832 in the engine Caledonia for the Liverpool and Manchester Railway. In the same year, the Ironsides, Matthew Baldwin's first engine, was put into service in this country. This was the beginning of the Baldwin Locomotive Works, the largest in the world.

Large wheels began to be the fad and 7, 8 and even 9 foot drivers were built. The Liverpool was one of the famous Crampton engines with the drivers behind the firebox. The Cornwall was built by F. Trevithick in 1847 and had drivers 8 feet 6 inches in diameter. As originally built, this had the driving axle *above the boiler*. This was afterward changed and the engine was running the 45 minutes express between Manchester and Liverpool as late as 1897,—a remarkable length of service for a locomotive. This attained a speed of 79 miles an hour as early as 1851, while speeds of 75 miles were frequently reported. In 1853 the locomotive superintendent of the Bristol and Exeter Railway built a class of tank engines with 9 foot drivers, which seem to have capped the climax for large driving wheels. A speed of 81 miles an hour has been claimed for these engines and it is said the average consumption of coke was only 21¼ pounds per mile. The first locomotive in England to have a Giffard injector was Ramsbottom's Problem, which was built in November 1859.

Tractive Power.—Tractive power is another name for drawbar pull and shows the amount of horizontal effort exerted by a locomotive. It depends on the steam pressure, size of cylinders and diameter of drivers. The original formula or rule takes into account the area of both cylinders, circumference of wheel etc.; but this has been boiled down by cancellation to the following: Tractive power equals the square of cylinder diameter, times stroke in inches, times mean effective pressure per square inch, divided by the diameter of the driving wheel in inches. Put in the shape of a formula this is:

$$\text{Tractive power in pounds} = \frac{d^2 \times S \times P}{D}, \text{ where}$$

d = diameter of cylinder,
S = length of stroke in inches,
P = mean effective pressure.
D = diameter of driving wheel.

For tractive power calculations, the mean effective pressure is generally taken as 85 per cent of the boiler pressure.

Taking the case of an 18 by 24 inch engine, 68 inch drivers, 200 pounds of steam, and we have

$$\frac{18^2 \times 24 \times 170}{68} \text{ or}$$

$$\frac{324 \times 24 \times 170}{68} = 19{,}440 \text{ pounds,}$$

drawbar pull, not allowing for internal friction of engine.

An easy way of reckoning is to remember that the cylinder diameter squared, equals the tractive power for one inch stroke, one pound pressure and one inch driver. Thus in the case above, if the stroke had been one inch, pressure one pound and driver one inch, the tractive power would have been 324 pounds. The actual pressure and stroke are multiplied by this and of course divided by the diameter of drivers, also in inches. From this can be readily seen how the diameter affects the tractive power and why freight engines have small drivers. If one engine has 84 inch drivers and another only 42 inches, other dimensions being the same, the latter will pull twice as much at drawbar, which means that it will start a train of double the size as the first. These calculations do not allow for internal friction.

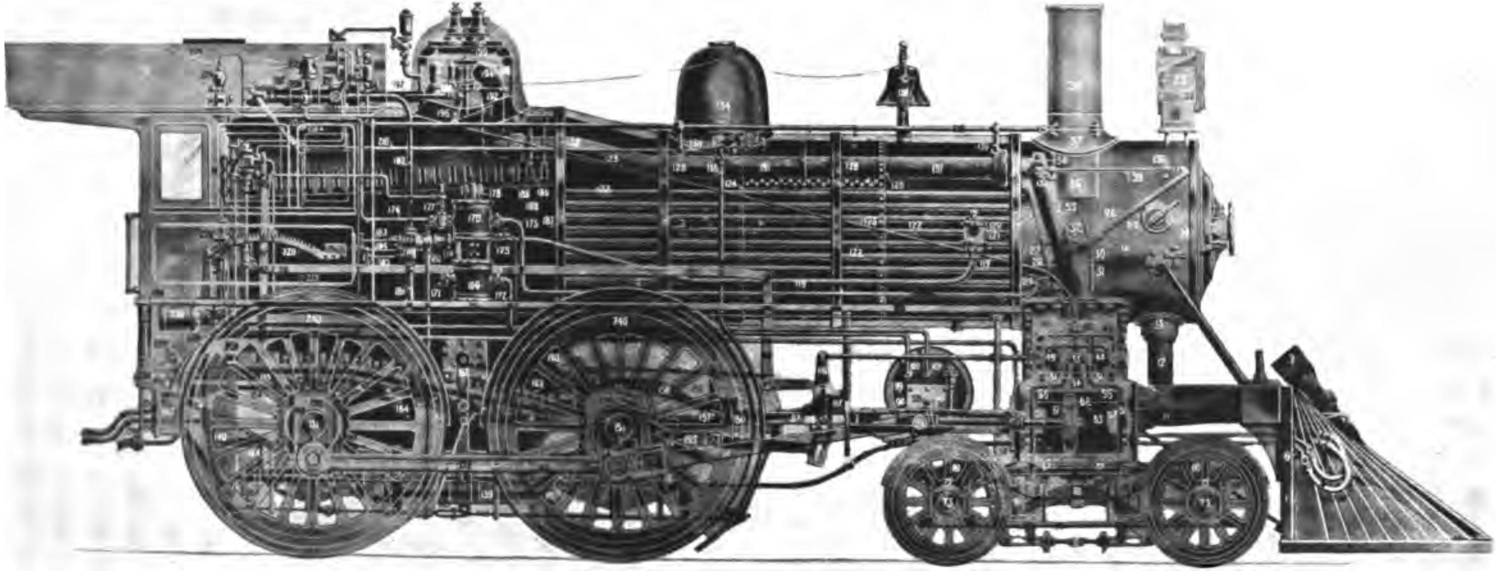
Driving Wheels.—The number of driving wheels depends on the work to be done. A fast passenger train with few stops is often handled by an engine having but one pair of drivers in Europe and in a few instances in the United States. While the engine may slip slightly on starting, the number of starts are few and there is no friction from side rods, as in coupled engines. Every pair of wheels coupled together means added friction of the side rods, but it also means a reduction of the chance of slipping at the start. A little thought will show that the main pair of drivers are the only ones really driving the engine, unless this pair tends or starts to slip. When this occurs the others take up their share of the work. As this only occurs at the start or on a heavy grade, the extra drivers are apt to be carrying wheels only, the greater part of the time, although the heavy trains now being hauled in freight service give nearly a maximum load to the engine. For an all around engine, the American or eight wheel engine still has the lead, although most modern freight engines have six and eight drivers, while some roads are using 10 wheel passenger locomotives; the great majority, however, are still eight wheelers. The question of weight on drivers is somewhat a disputed point, the generally accepted proportion being four times the maximum drawbar pull, that is, if the tractive power is 25,000 pounds, the weight on drivers should be at least 100,000 pounds. This is because it has been found that this ratio will hold an engine from slipping on a good dry rail. For poor or slipping rails sand is used unless the weight is sufficient, say six times the tractive power.

Although the number of driving wheels generally depends on the adhesion required, there are cases where light rails or poor roadbed prevent the necessary weight being put on the drivers needed for the work. In such cases more drivers are needed, more as carrying wheels than as drivers. In such cases, however, trailing or carrying wheels are used under the firebox. This is done on the Atlantic type of engine as well as on all single driver engines. The question of trucks under the front end seem to have been settled something as follows: Passenger engines on account of high speed, have a full truck to aid in rounding curves at speed. Freight or slow moving engines have a pony or half truck as in the mogul and consolidation engines. This gives the desired guiding of front end of engines and at the same time leaves nearly all the weight on drivers where it can do good work. In European countries freight or "goods" engines rarely have any trucks, all the weight being on the drivers, where it is effective for adhesion. This is possible on account of the roads being comparatively straight, but they would not do on our sharp curves on account of liability to derailment and wear of track.

Locomotive Types.—Classification was formerly accomplished by name only and as these varied somewhat in different parts of the country, the system caused some confusion. F. M. Whyte of the New York Central & Hudson River Railroad has devised a classification by numbers which is very simple, and which is being generally adopted. It consists of three parts to designate leading trucks, drivers and trailing trucks, each wheel counting one, thus 0-4-0

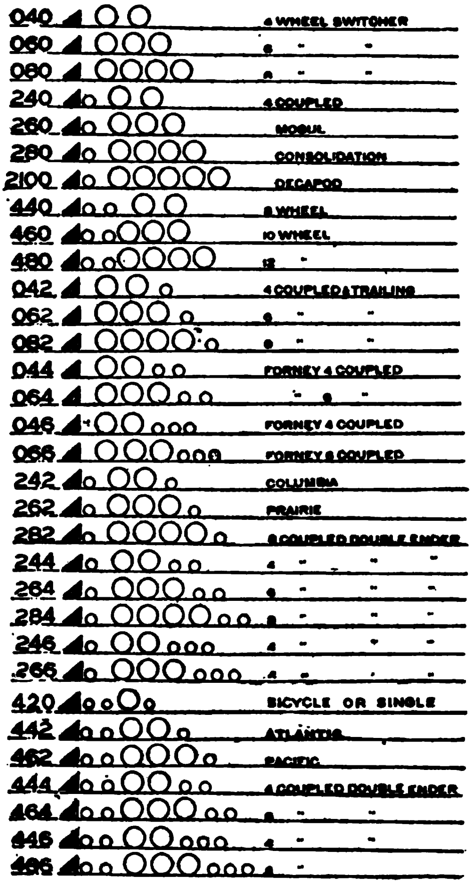
NAMES OF 240 PARTS OF A MODERN LOCOMOTIVE.

1. Pilot.
2. Draw Bar Plate.
3. Coupler.
4. Air Signal Hose.
5. Air Brake Hose.
6. Hose Hangers.
7. Buffer Beam.
8. Pilot Bracket.
9. Flagstaff.
10. Arch Brace.
11. Front Frame.
12. Cinder Chute.
13. Cinder Chute Slide.
14. Extension Front.
15. Headlight Step.
16. Signal Lamp.
17. Number Plate.
18. Smoke Arch Door.
19. Smoke Arch Front.
20. Smoke Arch Ring.
21. Headlight Bracket.
22. Headlight Case.
23. Headlight Reflector.
24. Headlight Burner.
25. Cleaning Door.
26. Netting.
27. Deflector Plate.
28. Deflector Plate Adjuster.
29. Air Pump Exhaust Pipe.
30. Blower.
31. Nozzle Stand.
32. Nozzle Tip.
33. Steam Pipe. (2.)
34. T or Nigger Head.
35. Dry Pipe Joint.
36. Petticoat or Draft Pipe.
37. Stack Base.
38. Smoke Stack.
39. Arch Hand Rail.
40. Oil Pipe Plug.
41. Cylinder Saddle.
42. Steam Chest Casing Cover.
43. Steam Chest Cover.
44. Steam Chest.
45. Relief Valve.
46. Balance Plate.
47. Balanced Slide Valve.
48. Valve Yoke.
49. Valve Stem.
50. Valve Stem Packing.
51. Valve Stem Connection.
52. Valve Seat.
53. Bridges.
54. Exhaust Port.
55. Front Train Line Cock.
56. Steam Ports.
57. Cylinder.
58. Back Cylinder-Head.
59. Piston Packing.
60. Piston Rod.
61. Piston Head.
62. Piston Packing Rings.
63. Truck Center Casting.
64. Front Cylinder-Head.
65. Cylinder Head Casing.
66. Cylinder Lagging.
67. Cylinder Casing.
68. Cylinder Cocks.
69. Cylinder Cocks Rigging.
70. Engine Truck.
71. Engine Truck Wheel.
72. Engine Truck Tire.
73. Engine Truck Axle.
74. Engine Truck Brass.
75. Engine Truck Box.
76. Engine Truck Pedestal.
77. Engine Truck Frame.
78. Engine Truck Pedestal Brace.
79. Engine Truck Frame Brace.
80. Engine Truck Equalizer.
81. Engine Truck Spring Hanger.
82. Engine Truck Spring.
83. Engine Truck Spring Band.
84. Front Signal Line Cock.
85. Safety Hanger.
86. Truck Brake.
87. Wheel Guard.
88. Air Signal Pipe.
89. Guides.
90. Guide Yoke.
91. Guide Block.
92. Main Rod.
93. Main Rod Front Strap.
94. Key.
95. Crosshead Pin.
96. Crosshead.
97. Front Frame.
98. Air Drum Bracket.
99. Air Drum.
100. Pump Connection.
101. Train Pipe Connection from Main Reservoir.
102. Valve Stem Rod.
103. Train Pipe.
104. Wash Out Plugs.
105. Link.
106. Suspension Stud.
107. Link Block Pin.
108. Link Block.
109. Eccentric Connection, Back Up.
110. Eccentric Connection, Go Ahead.
111. Link Hanger.
112. Tumbling Shaft Arm.
113. Tumbling Shaft.
114. Tumbling Shaft Lever.
115. Counter Balance Spring and Rig.
116. Rocker.
117. Rocker Box.
118. Reach Rod.
119. Branch Pipe.
120. Check Valve Case.
121. Check Valve.
122. Flues.
123. Oil Pipe.
124. Horizontal Boiler Seam.
125. Circumferential Seam.
126. Boiler Lagging.
127. Boiler Jacket.
128. Jacket Bands.
129. Hand Rail.
130. Hand Rail Brackets.
131. Bell Stand.
132. Bell.
133. Air Bell Ringer.
134. Sand Box.
135. Sand Box Lever.
136. Sand Pipe.
137. Driving Wheel Tire.
138. Driving Wheel Centers.
139. Ash Pan.
140. Driver Brakes.
141. Driver Springs.
142. Driver Spring Hangers.
143. Driver Spring Equalizers.
144. Driver Spring Hanger Brace.
145. Lower Rail of Frame.
146. Pedestal Brace.
147. Driving Box Shoe.
148. Driving Box Wedge.
149. Wedge Bolt.
150. Driving Box.
151. Driving Axle.
152. Side or Parallel Rod.
153. Rod Bush.
154. Main Rod Connection.
155. Main Frame.
156. Frame Brace.
157. Frame Splice.
158. Go Ahead Eccentric.
159. Back Up Eccentric.
160. Go Ahead Eccentric Rod.
161. Go Ahead Eccentric Strap.
162. Back Up Eccentric Rod.
163. Back Up Eccentric Strap.
164. Grate Shaking Rig.
165. Rocking Grates.
166. Expansion Pad.
167. Expansion Link.
168. Running Board.
169. Air Cylinder Brake Pump.
170. Steam Cylinder Brake Pump.
171. Air Strainer.
172. Delivery to Drum.
173. Drip Cock.
174. Pump Piston Packing.
175. Pump Exhaust Connection.
176. Pump Steam Connection.
177. Governor.
178. Pump Valve Case.
179. Injector.
180. Injector Overflow.
181. Water Pipe.
182. Steam Pipe.
183. Steam Valve.
184. Primer.
185. Water Valve.
186. Fire Box.
187. Tube Sheet.
188. Radial Stay Bolts.
189. Sling Stay.
190. Stay Bolts.
191. Dry Pipe.
192. Stand Pipe.
193. Dry Pipe Hangers.
194. Throttle Pipe.
195. Throttle Valve.
196. Throttle Bell Crank.
197. Throttle Stem.
198. Dome.
199. Dome Cap.
200. Dome Casing.
201. Safety Valves.
202. Chime Whistles.
203. Whistle Rig.
204. Ventilator.
205. Cab.
206. Air Pump Lubricator.
207. Air Gauge.
208. Steam Gauge.
209. Steam Turret.
210. Injector Throttle.
211. Blower Cock.
212. Gauge Lamp.
213. Signal Whistle.
214. Air Pump Throttle.
215. Throttle Lever.
216. Sand Lever.
217. Reverse Lever.
218. Engineer's Brake Valve.
219. Gauge Cocks.
220. Quadrant.
221. Cut Out Valve.
222. Fire Door.
223. Cylinder Cock Lever.
224. Sight-Feed Lubricator.
225. Oil Can Shelf.
226. Hand Hold.
227. Shake Lever Stub.
228. Ash Pan Damper Handle.
229. Whistle Signal Valve.
230. Brake Valve Reservoir.
231. Train Pipe.
232. Train Pipe Hose.
233. Signal Pipe.
234. Signal Pipe Hose.
235. Feed Pipe Hanger.
236. Feed Pipe.
237. Feed Pipe Hose.
238. Tail Piece of Frame.
239. Cab Bracket.
240. Counter Balance Weight.



SECTIONAL VIEW OF MODERN LOCOMOTIVE.

indicates no front wheels, 4 drivers and no trailing wheels, a plain 4 wheel switcher. Some leave out the hyphens between the numbers but it is sometimes likely to be confusing, as with the decapod which becomes 2100 without the hyphens or 2-10-0 with them. The following table makes it plain:



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FRED H. COLVIN, M. E.,
Author, 'American Compound Locomotives.'

Locomotive, Coaling of the Modern. The modern locomotive coaling plant is the product of three primary requirements, namely, reduction in cost of handling the coal; reduction of waste; and saving of time to locomotives at busy terminals and to fast trains on the line.

Twenty-five or 30 years ago it was said that there was probably no work on American railroads which was done in such a variety of ways as that of handling and supplying coal to locomotives. Nearly every road had its own particular method of doing it, which was usually determined by circumstances, tradition or perhaps prejudice. The importance of using improved methods of handling to enable some more accurate account of the fuel consumption of each locomotive to be kept, and to reduce the cost of handling, was coming to be generally recognized, however. Railroads running through mining districts were regarded as having a great advantage in this respect, as they could have their locomotives coaled direct from the mine chutes, thus minimizing the cost of handling, and at the same time enabling an accurate record of the amounts of coal taken to be kept, as the chute pockets were of known capacity. The best general practice at that time for the larger points was to take the coal from platforms alongside the track, which varied in dimensions and therefore in storage capacity, the figures for the latter ranging from 50 to 1,800 tons. Drop-bottom buckets holding from 1,000 to 2,000 lbs. and filled by shoveling, were lifted by derrick or crane, and their contents discharged into the tender. The larger platforms had a narrow-gage track and a truck on which the buckets were moved to the cranes. The coal had to be handled a number of times, as it was first shoveled from the cars to the platforms, again to the buckets, then moved by hand to the crane, hoisted by hand with the latter and finally dumped into the tender.

But the rapid growth of railroad transportation required that the coal be delivered to the locomotives more quickly and with a reasonable degree of economy, and a variety of devices of greater or less merit resulted. An early form used on the Philadelphia, Wilmington and Baltimore, now a part of the Pennsylvania, consisted of an inclined track alongside the main line, at the top of which was a shed with pockets for storing the coal. Small iron cars ran on narrow-gage tracks on each side, but at a lower level than the track on which the coal was received. A bridge ran across above and at right angles to the main-line tracks, the narrow-gage cars being run out on this bridge and dumped through suitable openings and chutes into the tenders below. It cost the road only one-fourth as much to handle its coal in this way as by previous methods (presumably buckets and cranes), not counting the great saving in time, engines being able to take coal in two and one-half minutes. But the principle toward which the best general practice tended, where the amount of coal handled justified it, was to provide storage for coal in bulk, delivering it to engines by weight or measure from pockets which were at a sufficient elevation to discharge to the tenders by gravity. The Baltimore & Ohio was one of the first to use this form, having it arranged to take coal on either side. The coal-receiving track was about 35 feet above the ground, and 11 or 12 feet below it was a platform about 20 feet wide, on which the coal was dumped. On each side of the platforms were bins 10 or 12 feet wide at the top, with bottoms inclined at about 60 deg. from the horizontal. At the lower end of each bin was an apron held up by counterbalance weights when not in use, but dropped down to about the angle of the bin bottom when the bin was emptied. Four strips were nailed around the inside of each bin to denote the amount of coal contained, the levels of these strips indicating 1½, 2, 2½ and 3 tons respectively. Engines were charged with the amount of coal taken, each bin being numbered. The platform and bins were not roofed over, leaving the coal exposed to the elements.

In 1885 a committee of the Roadmasters' Association investigated the costs of handling coal by the different methods in use. For handling over platforms of different constructions the maximum was 30 cents a ton and the minimum 11 cents, with an average 19.4 cents. For coal chutes the maximum was 9 cents a ton and the minimum 4.5 cents, the average being 7.4 cents. The average saving in favor of the chutes was therefore 12 cents a ton. The time consumed in taking coal from the chutes was one minute, and from other devices 12 minutes — a saving of 11 minutes per engine coaled in favor of the chutes. Where 3,000 tons were handled monthly there was a saving in favor of the chutes of nearly $4,500.

Improvements in chutes continued, the effort being to obtain a form that could be worked easily by one man, would have few parts in its construction and could be repaired at small cost. A chief objection to the earlier forms was that the combination of pulleys, chains and balance weights was such as to cause the aprons to close with considerable momentum, racking the entire mechanism and disarranging the working parts. A change to overcome this consisted in pivoting the apron so as to be self-balancing, discarding the chains and weights. This, however, threw a considerably increased weight and strain on these pivots; also the sides of the apron were liable to be pushed out unless supported. Furthermore, the top of the apron had to be locked to prevent its being blown open by a heavy wind. In 1891 the Susemihl chute was introduced on the Michigan Central. Chains and weights were used but they were so adjusted that «the outward pull of the top of the apron due to its vertical thrust beyond the pivot was taken exactly for each position of the apron.» Among other advantages, no latches were needed, the inner door being kept closed by the apron as it was lowered, by means of small segmental castings attached to the lower edge of the inner door, over which the lower edge of the apron rose as it descended. Very little iron was used in these chutes, the total cost of iron being only about $5. The total cost of the structure was said to be much less per pocket than any form then in use by the railroads.

Other designs of chutes with balanced aprons were shortly introduced, the object in each case being to have the vertical resultant of the counterweight vary the same as the weight of the apron. In the Williams, White & Company design the apron arm had fastened to its outer end cast-iron blocks which could be moved forward or back to adjust the proper balance. A small latch at the top held the apron and was pulled by the fireman when he wanted to take coal. The arm of the apron, in rising, came in contact with a latch which released the inner, or coal, door.

The modern method of lifting and transferring the coal by conveyors at locomotive coaling stations was first used in isolated cases in the early nineties. One of these plants was installed by the National Docks Railway of Jersey City, N. J., for the joint purpose of coaling locomotives and supplying a boiler house. The coaling track was also the coal supply track. The pit beneath the track had an inclined bottom which slid the coal sideways into an underground pit opposite the centre of the structure. The «endless bucket elevator,» as it was called, lifted the coal 39 feet and discharged it into bins at the top, the storage capacity being 200 tons. The elevator was driven by an 8-h. p. vertical engine, had 9 inch x 12 inch buckets spaced 12 inches apart, and had a capacity of 85 tons an hour.

As the demand for saving of labor and expense in the handling of fuel for heavy-draft and high-speed locomotives continued, the method referred to in the preceding paragraph was developed and perfected until at the present time the more complete of such plants are not only automatic in operation, reducing labor cost to a minimum, but the coal, which is stored in large quantities is also accurately weighed as it is withdrawn from the pocket, and the weight of the draft automatically registered and printed in triplicate. Also, many of these plants combine with them ash and sand handling facilities, so that a locomotive may have the operations of taking coal and sand and dumping ashes performed without moving, and almost simultaneously. In some cases the standpipe is so situated that water also may be taken without change of position. One of the best examples of a station of this sort was built for the Terminal Railroad Association of Saint Louis prior to the opening of the World's Fair, to enable a large number of locomotives to be cleaned, coaled, watered and sanded at one time. The station was built by the Link-Belt Machinery Company of Chicago. It has a storage capacity of 1,000 tons and is so arranged that seven locomotives can take coal, sand, water and discharge ashes at one time, and 21 locomotives may be cleaned simultaneously. The average number of locomotives handled daily is about 200. Tributary to the 1,000-ton pocket, which is 80 feet long, are 13 auxiliary pockets, each with a capacity of 15 tons and mounted on registering beam scales. There are six of these pockets on each side of the structure and one at the left-hand end. Running between these pockets, and swung from the girders above, is a walk for the scale-tender, who keeps the auxiliary pockets filled, the scale beams being an index to their condition at all times.

Coal is received on two separate tracks and is elevated to the storage pocket by a double system of Link-Belt carriers having a combined capacity of 2,000 tons in ten hours. The arrangement is such that either system may be put out of commission without interfering with the other. Electricity is used throughout for motive power. The loaded coal cars are drawn over the track hoppers and the empty cars removed by a double car-puller, shown in the drawings, having a capacity of eight loaded cars. Each cinder pit will accommodate three locomotives. Where there are a number of locomotives on one track awaiting the service of the station, the first one can take coal, sand and water simultaneously, requiring about four minutes if a full tank of water is needed. It can then move up to be cleaned, a second locomotive take its place under the station and a third move upon the pit, enabling all three to be cleaned at one time. The station will serve engines headed either way. An independent carrier receives the cinders from the track pits and deposits them in an overhead bin which discharges into a car on one of the coal tracks.

In this same track is a hopper for green sand, which is elevated by a carrier to two overhead circular steel tanks having a capacity of 125 cubic yards each. Each tank discharges into a dryer immediately beneath, the pipe from which passes up through the centre of the tank and assists in drying the adjacent sand. From the dryers the sand is again raised by carrier to the top of the structure and discharged by gravity into two storage bins of 85,000 lbs. capacity each, one being on each side of the station, midway of the tracks. The gravel and other refuse from the sand is discharged into the cinder bin. Water is delivered to the locomotives from two cylindrical tanks above the scale pockets, holding 20,000 gals. each. These tanks are connected to the city mains.

It will be noted that this station is built entirely of steel above the foundations, and covered with galvanized iron. This is not usual practice, timber commonly being used in these structures. Although the steel construction is somewhat more expensive in first cost, the combination of strength and lightness, the greater durability, the immunity from fire and the more pleasing appearance easily justify the additional expense. Several costly stations built of timber have been destroyed by fire and have entailed annoying difficulties and delays until they could be replaced.

The most recent practice is tending away from the combination of the ash-handling and coaling facilities in one plant, it being found more satisfactory in many cases to isolate the ash-handling plant. In a recent example of up-to-date locomotive coaling, sanding and ash-handling facilities, that of the Pittsburg & Lake Erie at McKees Rocks, the three plants are separate units.

The ability to weigh or measure the coal taken by each engine is regarded as highly important on some roads. If the tender is coaled from buckets or barrows, keeping record of the amount is a simple matter. Marking the insides of pockets to indicate given quantities of coal is another method. For weighing all of the coal in a large storage pocket there are two schemes. One of these is the McHenry dynamometer method. The bin or pocket rests on the top plate of a small chamber filled with a fluid which transmits the pressure through a small pipe to conveniently located pressure gages. By the other method the entire pocket is supported on scales, as in the Saint Louis station described above.

In regard to cost, a committee of the American Railway Master Mechanics' Association, reporting in 1901, expressed the opinion that the expense of coaling locomotives is governed entirely by the kind of cars in which the coal is carried, without reference to the kind of plant in which it is handled, provided the plant is one that will admit of dumping the coal either to bin or conveyor. If the coal is received in hopper-bottom or side-dump cars, the cost will probably be between one and three cents a ton delivered on the tender, no matter whether the cars are pushed up on an incline and dumped into pockets, or whether a system of conveyors is used. If the coal is received in gondola or box cars and has to be shoveled from the car, the cost will be from six to eight cents a ton delivered to the tender, regardless of the kind of coaling station through which it is handled. The majority of mechanical men replying to a circular of inquiry of a Master Mechanics' committee two or three years ago appeared to prefer the inclined-track coal chute where there is sufficient space.

In 1902 a committee of the American Railway Engineering and Maintenance of Way Association considered carefully the question of coaling stations. A list of the principal factors to be considered in adopting a method was given in that report as follows:

1. The question of location is one of the most important for consideration. This will be governed by the convenience as to the operation of the business of the railroad. At terminals and at junction points, it is probable that large coaling plants will be desired; but at intermediate points on the line coal must be supplied to locomotives hauling freight and passenger trains. The location may determine largely the nature of the plant to be used. Where large quantities of fuel are to be handled with only a limited amount of room for the construction of tracks and buildings, an expensive mechanical plant may be fully justified. At other points where land values are small, a totally different style of plant may be the most economical.

2. The quantity of coal to be handled will also largely influence the character of the plant to be built. Where but one or two carloads of coal per day are required, it is doubtful whether anything but the simplest plant should be built that is sufficient to permit delivering the coal required in the least possible time. On the other hand, where from 200 to 400 tons per day have to be handled, expensive plants, well designed machinery and first-class construction will be justified.

3. A third consideration is the cost of operation. This touches upon the labor question, involving the consideration whether steam engineers, machinists and expert mechanics, or crude day labor shall be utilized in connection with the operation of the plant. In some parts of the country day labor may be had at approximately one-half the rates which are demanded in others. The rate of wages to be paid to the laborer will be an important item.

4. A fourth consideration will be the amount of first cost, and also the cost of repairs and renewals. It is evident that to make a true comparison of the economy of different plants, these items should be reduced to a measure of cents per ton of coal handled, rather than to make a comparison of the gross amounts of actual cost and maintenance.

5. In the same connection, a true comparison will require a consideration of the interest on the cost of the investment, and this also should be reduced to an equivalent value of cents per ton of coal handled.

6. Complicating all of the above is the question of storage. That is a matter of great importance, and that it usually receives but little consideration, is evident from the amounts which are annually spent in storing coal on coal cars and holding the same on side-tracks at coaling stations, rather than constructing suitable storage bins in which the coal may be kept, thus liberating the cars for commercial business.

7. The kind of coal handled will also influence the decision — whether it be anthracite or bituminous, or both, inasmuch as the appliances which are efficient for one kind of coal may be less so for the others.

8. The facilities which each company has for delivering coal to its coaling plants will tend to make the situation more involved, since coal may be handled either in box cars, gondola cars (with stationary or with movable sides or traps), side-dumping or bottom-dumping cars, and other varieties, each of which will have its own influence on the special modification of plant to be adopted for economy.

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Locomotive, Design and Construction of the Modern. The various problems involved in the work of designing and constructing a modern, first-class locomotive are both many and complex. In the matter of design, the problems presented by such considerations as cylinders and wheel arrangements, are simple as compared to those relating to boiler power. It is evident that nothing can be gained by employing a large cylinder capacity unless a sufficient supply of steam can be maintained under all of the circumstances liable to be developed under normal working conditions. Therefore, the development of any one type more powerful than another can only be accomplished principally by an increase of grate-area and boiler-capacity.

In this respect, the foreign designers have been badly hampered by the limited character of the loading gauge; but, the limitations governing the matter of dimensions have always been much more liberal in America, so that in the matter of boiler design, American practice has not only reached a stage far ahead of that of any other country, but has also resulted in the replacement of the «American» type of locomotives universally employed on the American railroads prior to 1890, by much larger machines which are capable of developing more than double the amount of tractive power.

In considering the process which goes on within the fire-box of a locomotive, it is found that under favorable conditions, each pound of coal consumed will sustain one indicated horse-power for a period of about fourteen minutes, and that within certain limits the power developed is nearly proportional to the coal consumed. Therefore, in the development of the modern locomotive, the grate-area has been increased and the heating surface extended, thus enabling the burning of a larger amount of fuel, and consequently the maintenance of a larger supply of steam. On the other hand, although the American designer has not been restricted in the matter of dimensions, he has not been able to increase the working capacity of the fireman, so that after all, the power of the modern locomotive has not increased in proportion to its dimensions.

Under the most favorable conditions, a locomotive fireman will handle about 6,000 pounds of coal per hour, a rate which will serve to develop about 1,200 indicated horse-power. At short intervals this amount of power may be increased or out-run the rate of firing, but it fairly represents the maximum amount of power that can be developed under the circumstances, and the further development of the locomotive will depend upon the employment of some form of automatic stoker, which although guided in its operations by a man, will not represent the strength of only a single man.

The considerations relative to grate-areas and fire-boxes naturally lead to the question as to the practicability of obtaining better results by employing other forms of boilers than those in common use. Boilers with cylindrical corrugated fire-boxes such as the Vanderbilt boilers, were first applied to locomotives in the United States. The principal advantages claimed for this type of fire-box are: (1) a free water circulating area; (2) simplicity of construction; and (3) the elimination of screwed-stays and a copper fire-box. These advantages appear to have been realized in practice, and although boilers of this type are extensively used in this country, their employment in foreign locomotives has not been carried very much farther than a few experimental applications.

The water-tube boilers are another type which promote considerable speculation in this connection on account of their extensive adoption in the stationary and marine service. Many designs of water-tube boilers for locomotives have been proposed, but examples of their successful practical application are still lacking. The principal difficulty of applying a boiler of this type to a locomotive lies in the circumstance that the shell of the ordinary boiler serves as a part of the framework of the locomotive, and as it is not much heavier than the best water-tube boiler of the same capacity, it is impossible to abandon it without materially increasing the weight of the frame.

Besides the matter of the restricted grate-area already considered, another limitation which affected the earlier types of locomotives was that which related to their tractive power. The pull of a locomotive at the draw-bar depends upon its speed. At slow speed the maximum pull is limited by the adhesion or coefficient of friction between the wheels and the rails. After the speed has reached a point at which adhesion is sufficient to permit of the development of full power, the pull is inversely proportional to the speed. In a locomotive developing 1,200 horse-power, the pull at the speed of 25 miles an hour is about 22,000 pounds, and at 80 miles an hour, about 7,000 pounds. The latter amount, however, is still further reduced in actual practice by the usual loss of power between the cylinder and the draw-bar, so that the maximum pull of an engine running at a speed of 80 miles an hour is equal to about 5,000 pounds. On the other hand, in considering the tractive effort at starting, and assuming that the adhesion is equal to about one-fifth of the weight on the drivers, it is noted that the American type of locomotive built prior to 1890, carried a weight ranging from 14,000 to 16,000 pounds on each driver, and exerted at starting, a tractive effort which ranged from 10,000 to 12,000 pounds. It is noteworthy in this connection, that the wheel loads of the modern locomotives have been increased to such an extent that they are capable of developing a tractive force at starting equal to 5,000 pounds per driver, or a maximum of 20,000 pounds for the «American» type of locomotive.

It is also interesting to note, that even this amount is exceeded by the latest type of locomotive placed in service by the Pennsylvania Railroad Company, to haul their 18-hour trains between the cities of New York and Chicago. With the exception of the valve-gear connections, this locomotive is built on lines very similar to those of the «Atlantic» type of express locomotives. It is a simple engine having two outside cylinders 22 inches in diameter with 26 inches stroke, which are connected to four-coupled driving wheels of 80 inches diameter. Under a working boiler pressure of 205 pounds to the square inch, the maximum tractive effort at starting is equal to 25,800 pounds.

Under these conditions it is quite evident, that unless a harder material than the grade of steel now employed, can be obtained for rails and tires, so as to allow a further increase in the wheel loads, a greater tractive power can and will be obtained only by the use of more than four-coupled wheels.

These considerations and facts relative to boiler-capacity and wheel-arrangements, together with the fact that the steam-pressures used on simple engines became equal to and exceeded 200 pounds to the square inch, led to the development of the compound-locomotive. In the beginning, all efforts were directed towards the development of a two-cylinder type, under the impression that the number of parts of a compound-locomotive should not exceed that of a simple-engine; but, in the course of time, all locomotives increased in size without a corresponding increase in the tunnel and station platform clearance, thus prohibiting the use of the large low-pressure cylinders, and terminating the development of the two-cylinder compound.

These conditions led to the development of the four-cylinder compounds of the «Vauclain» or «Baldwin» type in the United States, and of the «De Glehn» type abroad. The application of the six-coupled wheel-arrangement was extended to the high speed passenger locomotives, and a powerful type of eight-coupled wheel, tandem-compounds was developed for the freight service.

The latest production in the line of powerful locomotives, is the mammoth mountain-climbing engine employed at the present time in banking service by the Baltimore & Ohio Railroad Company on their mountain division over a track composed of the heaviest of grades and numerous curves. It is an articulated compound designed on the «Mallet» principle with the «Mellin» system of compounding, and was built at the Schenectady Works of the American Locomotive Company, in 1904. Its wheel arrangement consists of 12 wheels divided into two groups of six wheels each, carrying separate pairs of cylinders — the high-pressure cylinders being employed to drive the rear, and the low-pressure cylinders the forward group of wheels. The forward group of wheels is arranged as a truck which pivots about a point near the centre of the engine. The frames of the forward engine are connected to those of the rear engine immediately in front of the latter by an articulated joint of cast-steel. The boiler is of enormous size — 7 feet 2 inches in diameter outside of the smallest ring, and 21 feet in length. The fire-box is 9 feet in length and 8 feet in width, inside measurement. The boiler tubes provide a heating surface of 5,366 square feet, and the fire-box an additional 219 square feet, making a total heating surface of 5,585 square feet, an area more than double that of the largest English locomotive. The grate-area is 72 square feet, and the working steam-pressure is 235 pounds to the square inch. The high-pressure cylinders are 20 inches, and the low-pressure cylinders 32 inches in diameter, with a common stroke of 32 inches. Steam is taken from the dome of the boiler by outside pipes to the high-pressure cylinders and after actuating the pistons therein, exhausts through a receiver pipe, 9 inches in diameter, to the low-pressure cylinders. Piston-valves 10 inches in diameter are employed in connection with the high-pressure cylinders, and double-ported slide-valves of the «Allan Richardson» type for the low-pressure cylinders. The valve-gear is of the «Walschaert» type throughout. The wheels are 4 feet 8 inches in diameter, and the wheel-base of each group of wheels is 10 feet, so that the total wheel-base of the engine is 30 feet 8 inches. The journals are 9 inches by 13 inches for the axles of the engine, and 5½ inches by 10 inches for those of the tender. The weight of the engine is 144¼ tons, all of which is available for adhesion. Its maximum tractive effort at starting is equal to 92,000 pounds, and it is capable of maintaining a tractive effort of 81,000 pounds at a moderate speed. It is by far the most powerful locomotive in the world, and was designed to meet conditions which included the hauling of trains composed of 50-ton cars, aggregating 2,222 tons in weight behind the tender, at a speed of ten miles an hour on a one per cent., grade around 30° curves and 20° reversed curves, the engine working compound, 315 pounds per ton resistance.

The following list embodies brief descriptions of the construction and operation of the various appliances and principal parts of the modern locomotive. For further information consult also the articles under the titles LOCOMOTIVE ENGINE; LOCOMOTIVE AND ENGINE INDUSTRY; LOCOMOTIVES, COMPOUND; and LOCOMOTIVE, COALING OF THE MODERN, in this Encyclopedia:

Air Bell-ringer.— Air-pressure connections for ringing the signal bell.

Air-brake Hose.— The flexible hose connections by which the brake-pipe of the locomotive is attached to that of another locomotive.

Air-cylinder of Brake-pump.— The lower cylinder of the air-pump which furnishes the compressed-air for setting the air-brakes.

Air-drum.— The main air-reservoir. See Main Reservoir.

Air-drum Brackets.— The flanged plates by which the air-drum is secured in place.

Air-gauge.— A pressure gauge provided with two hands, one of which indicates the amount of air-pressure in the main reservoir, and the other one the pressure in the main brake-pipe or train-pipe. In the latter the pressure is usually maintained at 70 pounds as indicated by the gauge, and in the main reservoir somewhat in excess of this amount, so as to ensure the proper action of the valves of the air-pump.

Air-pump.— An air-compressing pump which is worked by steam taken from the boiler. It supplies the compressed-air used for operating the air-brakes, and for signal purposes.

Air-pump Exhaust-pipe.— The pipe which extends from the steam cylinder of the air-pump to the steam-pipes in the smoke-box.

Air Signal-hose.— The flexible hose which connects the air signal-pipe in the cab with the air signal-pipe connections in the cars.

Air-pump Lubricator.— The cup or arrangement which contains the oil used in lubricating the air-pump. It is located in the cab.

Apron.— The sheet-iron plate which covers the space between the locomotive and the tender.

Arch-pipes.— The steam-pipes in the smoke box which connect the branches of the T-pipe with the steam-chests.

Axles.— The shafts which carry the driving-wheels, the truck-wheels and the wheels of the tender.

Bell-yoke or **Bell-stand.**— The cast-iron arch placed upon the top of the boiler, in which the bell is swung.

Bissel-truck.— A wheel arrangement or truck designed to relieve the lateral rigidity in locomotives, and facilitate their travel around curves.

Blow-off Cock.— A plug-cock at the bottom of the fire-box, by the opening of which the boiler is blown off or emptied.

Blower-pipe.— The pipe in the smoke-box connected with the blower-cock in the cab. By blowing steam through it, a draft is produced when the locomotive is at rest.

Boiler.— The vessel in which the steam used for driving the locomotive and operating its various auxiliary appliances, is generated.

Boiler-jacket.— See Jacket.

Bonnet.— The wire cap or netting placed over the chimney or smoke-stack to restrain the sparks and cinders.

Boxes.— The bearings which rest upon the journals of the axles.

Brake.— The appliance by which a locomotive or a train is brought quickly to a standstill. Ordinarily, it consists of a flexible piece of strap-iron lined with wooden blocking which is applied to the tires of the wheels by means of rods and levers actuated by the pressure of compressed-air, or by hand.

Brake-pipe.— The pipe through which compressed-air is conducted from the various air-reservoirs connected with the air-pump, to the brake-cylinders of the locomotive, the tender, and the cars composing the train. Each car has its own brake-pipe and brake-cylinder. When the cars are made up into a train, these pipes are connected with each other and with those of the tender and the locomotive, by means of flexible hose, and when thus connected, it is called the train-pipe.

Branch-pipe.— The pipe which connects the injector check-valve with the boiler.

Brasses.— The boxes on the cross-heads and the crank-pins.

Brick-arch.— A slab of brickwork placed across the front end of the furnace, directly over the fire, to hold the smoke and gases in contact with the fire until they become thoroughly mixed.

Bumpers or **Buffers.**— Massive pieces of timber bolted to the front end of the engine frame, and to the rear end of the tender.

Bumper Blocks.—Pieces of timber bolted to the bumpers for the purpose of reducing the shock of impact when the cars come together.

Bumper Sheet.— A sheet of metal placed on the front end of the frame, to cover the space between the bumper and the cylinders.

Cab.— The hood or house placed on the back end of the boiler, and over the foot-plate, for occupancy by the engineer and fireman.

Cab Handles.— Handles attached to the sides of the cab for the use of the engineer and fireman, in getting on or off the engine.

Cellars.— Recesses or chambers in the jaws of the boxes, which hold the oil for lubricating the journals.

Centre-casting.— The cast-iron plate which connects the truck bolster to the front-end of the boiler.

Check-chamber.— A chamber attached to the waist of the boiler, through which the water passes from the connecting pipe to the boiler.

Check valve.— A wing-valve inserted in the feed-pipe between the feed-pump and the boiler, to prevent the return of the water from the boiler to the pump.

Connecting-pipe.— The feed-water pipe which connects the pump with the check-valve.

Connecting-rods or **Main-rods.**— The rods or bars attached to the piston-rods, and by means of which the power developed in the cylinders is transmitted to the driving-axles. They convert the rectilinear reciprocating motion of the pistons into the rotary motion of the crank-pins of the main driving-wheels.

Counter-balances or **Counter-weights.**— Large blocks of iron cast on or otherwise secured in place between two or more spokes of each driving-wheel, opposite the crank-pin, for the purpose of balancing the weight of the parallel and main rods, and to steady the motion of the engine by equalizing the forces or moments around the revolving axle.

Coupler.— See Draw-bar.

Coupling-rods.— The rods by which the crank-pins on adjoining driving-wheels are connected together, so as to cause the wheels to revolve in unison.

Cow-catcher or **Pilot.**— A triangular structure of wood, or iron bars, or curved sheet-metal, attached to the front end of the locomotive. It is provided for the purpose of removing stray cattle and other obstructions from the track, and thus prevent them from getting under the wheels.

Crank-pins.— The pins or movable journals which unite the connecting-rods with the cranks or shafts of the driving-wheels.

Cross-heads.—Blocks which move in guides and unite the piston and connecting-rods, and slide-blocks together.

Cross-head Pins.— The pins in the cross-heads to which the main-rods are attached.

Crown-bars.— Bars placed on the upper side of the crown-sheet in the water-space, with their ends resting on the edge of the furnace-sheet, to strengthen the crown-sheet.

Crown-sheet.— The top sheet of the furnace, to which the crown-bars are attached. It is placed directly over the fire.

Cut-off.— The termination of the period of admission of steam into the cylinders. The point of cut-off is regulated by the amount of lap on the slide-valves.

Cylinders.— Steam-tight, metal receivers attached to the front end of the boiler on each side of the lower part of the smoke-box. They contain the pistons, which are actuated by the steam obtained from the boiler. There may be two, four, or eight of them, according to the type of locomotive — simple-engine, compound-engine, and tandem-compound engine, respectively. They are called high-pressure, or low-pressure cylinders, according to the manner in which the expansive energy of the steam is utilized therein, and are given the additional designations — outside, or inside cylinders, according to their position relatively to the engine frame.

Cylinder-cocks.— Small cocks placed on the lower parts of the cylinder-ends, to drain off the water of condensation, prior to starting the engine, and thus prevent the possibility of blowing out the cylinder-ends.

Cylinder-ends or **Cylinder-heads.**— The front and back ends of the cylinders. The latter hold the stuffing-boxes through which the piston-rods move.

Dampers.— The doors in the front and rear ends of the ash pan, by which the air admitted to the furnace is regulated.

Damper-handle.— The bar which passes through the foot-plate, and by which the dampers are opened and closed.

Dashers.—The sheet-iron plates attached to the inside shell of the boiler, opposite the pump-check, to prevent the cold water from drenching the tubes.

Deflector.— A bell-shaped or trumpet-mouthed opening used in the furnace to effect a mixing of the air and gases so as to cause the latter to ignite and thus render the combustion of the fuel more perfect.

Dome or **Steam-dome.**— The elevated, dome-shaped chamber on the top of the boiler, from which the supply of steam for the cylinder is taken. The steam being partially superheated, it is consequently hotter and drier in the dome than elsewhere, and when used from the dome, diminishes the tendency to priming in the boiler.

Dome-bodies.— The sheet-iron jackets which envelop the dome outside of the wooden "lagging."

Dome-stays.— The braces attached to the crown-bars and the dome, to strengthen the dome and the crown-sheet.

Dome-cover or **Dome-top.**— The covering which encases the dome, and to which the safety-valves and the whistle-stand are attached.

Draw-bar or **Coupler.**— The bar attached to the front of the pilot, by means of which the locomotive may be attached to cars or to another locomotive. The name is also applied to the rod or bar by which the locomotive is coupled to its tender.

Drip-cock or **Drip.**— The receptacle placed under the gauge-cocks, to receive the water and steam discharged from the cocks, and drain it into a discharge pipe.

Driving-saddles.— The yokes which straddle the frame and support the driving-springs.

Driving-springs.— See Springs.

Driving-axles.— The axles which communicate the motion of the connecting-rods directly to the driving-wheels.

Driving-wheels or **Drivers.**— The wheels which are attached to the driving axles. The driving-wheel arrangement of a locomotive may consist of the 4-coupled, 6-coupled, or of the 8-coupled wheel type. They form what is called the "wheelbase" of the locomotive. The tractive power of a locomotive is derived from the adhesion of the driving-wheels to the rails, and depends upon the weight of the locomotive and the area of the wheelbase.

Eccentric.— The cams on the driving-axles or crank-shafts of engines by means of which the rotary motion of the axles or shafts is converted into the rectilinear reciprocating motion which operates the slide-valves. This change in motion is effected by giving the cam a definite "throw" or eccentricity equal in amount to one-half of the travel of the valve. A locomotive has two pairs of eccentrics and their attachments. One eccentric of each pair is set on the shaft in such a position that the operation of the valves will run the engine in one direction, and the other one is set so as to operate the valve to run the engine in the opposite direction. They are referred to by various terms, such as "forward eccentric" and "backward eccentric" or "go-ahead eccentric" and "back-up eccentric," according to the direction of the motion given to the locomotive by their action on the valves. The ends of each pair of eccentrics are attached to a "link" by means of which either of the eccentric-rods is engaged with or disengaged from the "rockers" connected to the valve by the valve-rods or valve-stems. The links are suspended by the "link-hangers" to the ends of the arms attached to the "lifting" or "tumbling shaft." This shaft has another upright arm on the right side of the engine, the upper end of which is connected by the reversing-rod to the reverse-lever in the cab, by means of which the engineer controls the operation of the valves.

Eccentric-lug.— The projecting portion of an eccentric-strap, to which the eccentric-rod is attached.

Eccentric-sheave.— The body of the eccentric or the eccentric itself, which is forged or keyed directly on to the axle or crank-shaft, the throw of which is communicated to the eccentric-strap.

Eccentric-strap or Eccentric-hoop.— The belt of metal which encircles the eccentric-sheave and transmits its motion to the eccentric-rod to which it is attached.

Engineer's Brake-valve.— The air-valve arrangement located on the right side of the cab, by means of which the engineer operates the driving-wheel and other brakes on the locomotive, and also the several sets of air-brakes attached to the cars of the train.

Engine-truck.— See Truck.

Equalizing-levers.— Bars suspended at their middle points underneath the engine-frame, and connected at their ends to the springs of the driving-wheels, for the purpose of distributing the force of the shocks or jars that may be received by the wheels.

Equalizing-springs.— The spiral or elliptical springs on the reverse-shaft, provided for the purpose of equalizing the weight of the links.

Exhaust-port.— The middle opening in the seat of each slide-valve, through which the exhaust-steam escapes from the cylinders into the exhaust-pot in the smoke-box. The area of an exhaust-port is usually made to exceed that of a steam-port by one-half, in order to diminish the evil of back-pressure. See Slide-valve.

Expansion-clamps.— The clamps bolted over the main-frames and the furnace-pads, to allow for the expansion of the boiler under the influence of heat. Also, the clamps bolted to the fire-box under the main-frame to hold the latter against the liners. When the boiler expands, the frames slide through the clamps longitudinally.

Expansion-joint.— A sliding joint provided in the throttle-pipe, or other steam pipe, to allow for expansion and contraction under changes of temperature.

Feed-pipe.— The pipe which conveys the feed water from the feed-pump to the boiler. See Injector.

Feed-pump.— The force pump which supplies the boiler with feed-water. It forces the water into the boiler against the pressure in the boiler. See Injector.

Feed-tank.— The water tank provided for the purpose of holding the feed-water for the boiler. It is located in the tender.

Feed-water.— The water used for the supply of the boiler.

Feed-water Cocks.— Cocks inserted in the ends of the feed-pipe hose-connections, to regulate the supply of water to the pump.

Feed-water Shafts.— Vertical shafts which pass through the foot-plate to the feed-water cocks, and are operated by means of cranks.

Fire-box.— The furnace, or that part of the boiler, in which the fuel is burned.

Fire-door.— The door in the back end of the boiler, through which the fuel and the firing-irons are introduced into the fire-box.

Flagstaffs.— Iron tubes placed at each end of the bumper or buffer above the pilot, for the purpose of holding the staffs of signal flags or lamps.

Flues.— The tubes in the boiler which carry off the smoke and the waste-gases from the fire-box to the smoke-box, and thus produce the draft necessary for the combustion of the fuel. They are made of iron, or of copper, the diameter of the tubes being kept as small as possible so as to subdivide the volume of the smoke and gases into a large number of small streams, thus exposing them to a large radiating surface, through the medium of which the heat is transmitted to the water surrounding the tubes.

Follower-bolts.— The bolts by which the follower-plates are secured to the piston-heads.

Follower-plates.— The plates which cover the spring-packing on the front ends of the piston-heads.

Foot-board.— A platform on the back end of the boiler, on which the engineer stands.

Foot-plate.— A cast-iron plate bolted to the back end of the frame opposite the fire-door.

Frame.— The strong metal skeleton which supports the boiler, machinery, and axles of the locomotive. It is usually made in two parts — the back part to which the driving-boxes, axles and wheels are attached, being called the main-frame, and the front part to which the cylinders are bolted, being called the front-frame. When formed of plates of sheet-metal, it is called a plate frame, and when composed of iron bars it is called a bar frame. The former is employed in the foreign, and the latter in the American practice.

Frame-braces or Pedestal-braces.— Strong bars which unite the inner-legs of the main-frame with each other, and the back outer-leg of each frame to the back end of the frame.

Frame-splice.— The connecting arrangement between the front and main frames.

Front-end.— That part of the locomotive which includes the extended outer-shell of the boiler, comprising the smoke-box and all of the appliances contained therein, such as steam and exhaust pipes, nettings, diaphragms, draft-pipes, and the base of the smoke-stack. The function of the front-end is to draw atmospheric air into the ash-pan, and thence through the grate and the fire-box, and to draw the furnace gases through the flues, and thence under the diaphragm into the smoke-stack, and force them out into the atmosphere.

Front-rail.— A single-bar attachment which extends from the front of each of the main frames to the front bumper.

Frost-cocks.— Cocks provided for the purpose of admitting steam from the boiler to the feed-pipes, to prevent them from freezing in cold weather.

Frost-plugs.— Plugs screwed into the pump chambers and pump cages to allow the water to drain out and prevent them from freezing.

Fulcrum.— The fixed point upon which the levers of the safety-valves are supported, and upon which they turn.

Furnace-pads.— The knees bolted on the shell of the fire-box, to place the weight of the boiler on the frame.

Furnace-rings.— The wrought-iron rings which connect the outside and inside sheets in the water space at the bottom of the furnace.

Gauge Cocks.— The cocks, usually three in number, attached to the back end of the boiler at different heights, which indicate the level of the water in the boiler at any time.

Gauge Lamp.— The lamp placed in the cab, to illuminate the dials and tubes of the various gauges.

Gib.— The fixed wedge employed to compensate the wear in the boxes, on the cross-heads, and of the crank-pins.

Gland.— A bush by means of which the packing in the stuffing-boxes is secured in place, to receive the wear of the piston-rod, and to prevent the leakage of steam.

Glass-gauge.— A glass tube attached to the back end of the boiler and connected with the steam and water valves, to indicate the height of the water in the boiler.

Goose-neck.— A bent pipe of brass, or iron, employed to connect the front end of the feed-pipe with the lower chamber of the pump.

Governor or Pump-governor.— A valve arrangement connected with the steam pipe and the brake-pipe or train-pipe attached to the air-pump. It is employed to regulate the action of the pump in operating the air-brakes. It is usually set to maintain a pressure of 70 pounds as indicated by the air-gauge.

Grate.— The area made up of the grate bars in the fire-box, on which the fuel is burned.

Grate Shaking-rig.— A bar attached to the movable grate-bars of shaking or rocking grates, by which they are moved back and forth with a rocking motion, thus disturbing the fire over the whole area of the grate, to effect proper combustion. It is operated by means of a suitable lever placed in the cab.

Guide or Guides.— The attachment or sleeve on the front end of the steam-chest, in which the ends of the valve stems move. Also the piece to which the throttle-valve lever is attached, to prevent it from slipping when the locomotive is in motion.

Guide-bars or Guides.— The parallel bars between which the cross-heads move, thus giving a perfectly horizontal motion to the piston-rods. They may consist of two parallel bars, "double-guides," or a single guide-bar, attached to the back head of the cylinder and to a support called the "guide-yoke," a strong plate usually fastened to both the frame and the boiler, and placed across the frame at a point well forward of the front driving-wheels.

Guide-blocks.— The blocks on the back-head of the cylinders, and on the guide-yoke, to which the guide-bars are attached. In the case of double-guides, these blocks can be planed off so as to permit of the guide-bars being brought nearer together when the slides are worn down; or, liners may be placed between the blocks and the bars, which can be removed when it is necessary to bring the guide-bars closer together.

Guide-brace.— A brace attached to the guide-yoke at one end, and to the boiler at the other, to support the guide-yoke.

Guide-yoke or Guide-bearer.— See Guide-bars or Guides.

Hand-hold.— See Cab-handles.

Hand-holes.— Openings provided in the outside shell of the furnace near the ring, through which deposits of rust or dirt in the water-legs of the furnace are removed.

Hand-rails.— Brass or iron pipes attached by brackets or studs to the upper part of the boiler, and extending from the cab to the smoke-box. They are used by the engineer in getting on or off the running-board.

Headlight.— A large lamp placed on the front end of the locomotive to illuminate the track in front and thus disclose any obstructions that may exist thereon, and to signal the approach of the locomotive. It consists of an "oil-reservoir" surmounted by an "Argand" burner, and a parabolic "reflector," all of which are enclosed in a metal "case," which is placed on the top of the smoke-box, or supported on two "brackets," with a shelf between, bolted to the front of the smoke-box.

Heater-cocks.— Cocks attached to the back end of the boiler, by which steam is blown through the feed-pipes, to prevent them from freezing in cold weather.

Hollow-stays.— Hollow stay-bolts inserted through the inside and outside sheets of the furnace near the crown-sheet, through which air is admitted to the furnace to increase the combustion.

House.— See Cab.

House-boards.— The boards attached to the sides of the boiler, upon which the house or cab rests.

House-brackets.— Brackets attached to the back-bumper, to support the house-boards.

Induction-ports.— The passages in the valve-seats, through which steam is admitted to the cylinders. See Steam-parts.

Injector.— A mechanical device by means of which a continuous supply of feed-water is given to the boiler. It acts on the principle, that if a jet of high-pressure steam issuing from a boiler at a high velocity, is brought into contact with a body of cold water, the steam will partially condense and combine with the water and thus impart a portion of its velocity to the water, and induce a current of water to flow into the same boiler against the pressure of the water in the boiler. Partial condensation of the steam is essential to efficient action. The injector will not feed water too hot to condense the steam.

Injector Over-flow or **Injector-nozzle.**— The pipe which connects the overflow-space in the injector. If more water has been supplied to the jet of steam than it is capable of carrying into the delivery-tube of the injector, a part of the water will escape through the overflow-nozzle. On the other hand, if too little water has been supplied, air will be drawn in through the nozzle, and carried into the boiler.

Injector-throttle.— The arrangement by which the water passage between the steam-nozzle and the combining-tube of the injector is changed in size automatically or by hand, to suit the changes of steam-pressure in the boiler.

Jackets.— The outside coverings of the cylinders and the boiler. The boiler jacket is composed of layers of wood called "lagging" about seven-eighths of an inch in thickness, felt, and Russia iron, placed around the boiler to prevent the loss of heat by radiation and convection.

Jam-nuts.— Lock-nuts used for setting-out the spring-packing in the piston-heads.

Jaws.— The parts of the frame formed by the frame-legs, and which hold the axle-boxes.

Journals.— That part of the axle on which the weight of the locomotive rests. The journals are situated on the inner side of the wheels, and turn on brass "journal-bearings" which resist the friction of the revolving axle. The bearings are held in cast-iron or steel boxes called "journal-boxes" or "axle-boxes."

Keys.— The wedges employed to tighten the "straps" which hold the "brasses" at the ends of the connecting-rods. As these keys are very liable to loosen and fall out, they are secured in place either by screws and nuts, or by a set-screw on the other side of the rod.

King-bolt or **Centre-pin.**— The bolt or pin which passes through the centre-casting and the centre of the truck, thus making a flexible connection between the engine and the truck, enabling the latter to turn about the king-bolt so as to allow the axles to assume positions approximating the radii of the curves of the track.

Knuckle-joints.— The joints on the valve-rods, which allow the rods to vibrate freely with the radius of the rocker-arm.

Lifting Shaft.— See Eccentric.

Link.— A variable-radius expansion-gear by means of which the slide-valves are operated. See Eccentric.

Link-block.— A block which fits into the curved slot of the link, and moves freely from one end to the other thereof.

Link-block Pin.— The pin which connects the link-block to the lower rocker-arm of the valve-gear.

Link-hangers.— Rods or bars by which the links are suspended to the horizontal arms of the lifting-shaft by two pins, the upper one being attached to the arm, and the lower one to the link-saddle bolted to the link.

Lower Rail Frame.— See Frame.

Lubricator.— The valve through which oil or tallow is admitted to the cylinders for the purpose of lubrication. These valves communicate with the cylinders either through the steam-chests or through a pipe leading from the cab. The lubricators placed in the cab are called sight-feed lubricators. In these lubricators, the weight of a column of water displaces the oil in the cup, causing it to flow upwards drop by drop, through water in glass tubes, to the pipes leading to the steam-chests. The flow of the oil is thus placed constantly in sight of the engineer, and enables him to know whether the lubrication is continuous and regular or otherwise.

Main-frame.— See Frame.

Main Reservoir.— The main air-reservoir of the locomotive. It is usually located on the front of the main frame, and immediately behind the cylinders.

Main-rods.— See Connecting-rods.

Main-rod Connections.— See Connecting-rods.

Main-rod Front-strap.— See Connecting-rods.

Mud-drum.— A cylinder attached to the under side of the "waist" of the boiler, to receive the deposits from the feed-water. This material is discharged from the drum by means of a valve called the "mud-cock."

Mud-holes.— Openings provided in the back end of the fire-box, through which the accumulations of mud in the lower water-space are removed. These openings are usually closed by means of brass plugs.

Mud-ring.— The wrought-iron ring which unites the inner and outer shells of the fire-box; completely surrounding the inner shell and closing the water space between the two shells.

Netting.— Wire netting placed in the front end of the smoke-box, and in the chimney or smoke-stack. This netting acts as a sieve, arresting the sparks and cinders, but allowing the smoke to escape freely.

Nozzles.— The contracted tube called the "steam-nozzle" in the injector, through which the jet of steam from the boiler is conducted to the combining-tube of the injector. Also, the outlets of the exhaust-pipes, called "exhaust-nozzles," in the smoke-box.

Nozzle-stand.— The supports of the exhaust-nozzles in the smoke-box.

Nozzle-tips.— The rings or bushes fitted into the tops of the exhaust-nozzles. They are held in place by means of set-screws so as to permit of their being readily removed and others with larger or smaller openings substituted, to adjust the size of the blast orifices so that they will be small enough to produce the required draft, and yet be as large as possible to reduce the amount of back-pressure.

Oil-cups.— Cylindrical metal receptacles with glass linings, employed to contain oil, and to distribute it to moving contact surfaces, for the purpose of lubricating them. Such cups are attached to the guides and the connecting rods above the bearings and the crank-pins. The oil-cup for lubricating the main or slide valves is placed in the cab where it is under the control of the engineer. See Sight-feed Lubricator.

Packing.— The hempen, metallic, or other substance used in the stuffing-boxes, and in the steam and pump cylinders, to make the moving parts of the pistons steam and water tight.

Petticoat or **Draft Pipe.**— The pipe through which the exhaust-steam is conducted to the exhaust-nozzles in the smoke-box, thus creating a partial vacuum in the smoke-box, which sucks the smoke and gases out of the flues with great power, and forces them out into the open air by the blast or the action of the exhaust steam.

Pilot.— See Cow-catcher.

Piston-head.— The solid or hollow disc-like plunger in the cylinder which is moved with a reciprocating or forward and backward movement by the action of the steam, thus converting the energy of the steam into the motion which drives the engine.

Piston-packing.— The packing by means of which the piston-rods are made steam tight.

Piston Packing-rings.— The rings of cast-iron, wrought-iron, steel, or gun-metal which form the peripheral portions of the piston-heads, and make a steam-tight joint between the piston-heads and the inside surface of the cylinders. They are made thin and turned slightly larger than the bore of the cylinders, and thicker on one side than on the other so as to act as a spring when they are slotted diagonally across and forced into the cylinders between the piston covers. After being placed in position, their elasticity tends to thrust them outwards and thus maintain a steam-tight joint with the bore of the cylinder.

Piston-rod.— The rod attached to the piston-head, and by means of which the motion of the piston-head is communicated to the connecting-rod or crank. It works through a packed stuffing-box which prevents the leakage of the contents of the cylinder.

Primer.— The valve by means of which the air in the water-space of the pump is expelled, and a partial vacuum produced so as to cause an inflow of water to start the action of the pump.

Pump-governor.— See Governor.

Quadrant.— A slotted curved bar which holds the reverse-lever in the proper position by means of a reverse-latch. Also, a toothed bar located in the cab, by means of which the variable-exhaust is regulated.

Radial Stay-bolts.— Stay-bolts screwed into the outer shell of the boiler radially to its cylindrical form, and as nearly as possible at right-angles to the surface of the crown-sheet which they are designed to support.

Radius-bar.— The angle-bar attached to the back end of the truck frame and to the radius-bar cross-tie by means of a pin.

Reach-rod.— The rod which connects the reverse-lever with the reverse-arm of the reverse-shaft.

Receiving-ports or Steam-ports.— The passages in the seats of the slide-valves through which the steam is admitted to the cylinders from the steam-chests.

Reverse-latch.— The tongue which fits into the notch of the quadrant by which the reverse-lever is held in the right position.

Reverse-lever or Reversing-lever.— The lever by which the direction of motion of the locomotive can be changed, and the travel of the valves increased or decreased. It is located in the cab within easy reach of the engineer.

Rockers.— The double-cranks connected with the link-blocks at one end and the valve-rods at the other, and through which the valves receive the motion of the eccentrics and links.

Saddle-pin.— A pin by which the link-hangers are attached to the saddle-plate, and by means of which the link is raised or lowered.

Saddle-plate.— The plate which fits into and slides in the slot of the link.

Safety Chains.—Chains employed to couple the locomotive to the tender, in addition to the attachment effected by means of the draw-bar, as a safeguard in case of the fracture of the latter. They are attached to the safety-hooks bolted to the back-bumper of the locomotive.

Safety-hangers.— Chains fastened to the front-bumper and to the front end of the truck-frame, to prevent the truck from swinging around and breaking the links in case the locomotive happened to run off the track.

Safety-valves.— Spring-valves attached to the dome-cover, by which the steam-pressure in the boiler is prevented from exceeding a certain limit. Usually there are two of these valves, so as to provide against the contingency of the breakage of one of them.

Sand-box.— The cylindrical or dome-shaped box attached to the top of the boiler to contain the sand used for the purpose of sanding the rails in order to increase the adhesion, and prevent the driving-wheels from slipping at starting, or when hauling a heavy load, or when running up a heavy grade.

Sand-box Lever.— A lever located in the cab, and which communicates with the rod by means of which the sand-valves are operated by the engineer.

Sand-pipes.— The pipes on each side of the locomotive through which the sand from the sand-box is conveyed to the rails in front of the driving-wheels.

Shake-lever Stub.— The cab end of the lever of the grate shaking-rig.

Side-rods or Parallel-rods.— See Coupling-rods.

Sight-feed Lubricator.— See Lubricator.

Signal-pipe.— The air-pressure pipe by means of which the engineer communicates with the trainmen.

Signal-whistle.— A steam-whistle attached to the top of the dome. It consists of an inverted metal cup, usually made of brass, which is placed immediately over the annular opening of a hollow valve-stem screwed into the top of the dome. Communication with the steam-space within the dome is effected by opening or by closing a valve attached to a spindle which extends upwards into the valve-stem. The valve is operated by the engineer by means of a rod which connects the operating lever of the valve with the cab. When the valve is opened, the steam escapes through the annular opening in the valve-stem, strikes against the edges of the inverted cup, and produces the sounds which are utilized to give signals to the trainmen, to warn people off the track, and to signal the approach of the train to stations and crossings.

Slide-valves.— The valves which control the admission and exhaust of steam to and from the cylinders. They are operated by the rotary motion of the axles of the driving-wheels which is converted into rectilinear reciprocating motion on the valves in the following manner: The steam is admitted through two channels called "steam-passages" which are cast in the cylinder, and terminate in a smooth, flat surface, called the "valve-seat." The valve-seat has two openings called "steam-ports" for the admission of steam and a cavity called the "exhaust-port" which is situated between the steam-ports, and communicates with the open air through pipe connections leading into the exhaust-pipes in the smoke-box. A valve called a "slide-valve," made of cast-iron, and provided with a cavity in its under side, is fitted on the valve-seat in such a manner, that when it is moved backwards and forwards, it will alternately cover and uncover the two steam-ports, simultaneously admitting steam to the front end of the cylinder and exhausting it from the back end, and then admitting the steam to the back end of the cylinder and exhausting it from the front end. This reciprocating motion of the valve is derived from the rotary motion of the driving-axles of the locomotive, which is converted into rectilinear reciprocating motion by means of the "eccentric," the "link," the "rocker" and the "valve-rod" placed between the cylinder and the driving axle, and connecting the latter with the stem of the valve.

Smoke-box.— A cylindrical chamber at the front end of the boiler, which is utilized to contain the "arch-pipes," the "lifting-pipes," the "exhaust-pots," the "exhaust-nozzles," the "steam-pipes" and the "exhaust-pipes." It also forms a convenient receptacle for the smoke before it escapes into the open air through the smoke-stack. The "smoke-arch ring" divides the smoke-box proper from that portion of the smoke-box which is commonly known as the "front-end," and into which it opens through the "smoke arch door" in the "smoke arch front." The front-end gives the additional room required to contain the "deflector" and the wire netting which comprise the spark arresting appliances.

Smoke-stack.— The chimney through which the smoke escapes from the smoke-box. Smoke-stacks are made in a number of forms, to suit the conditions attending the burning of different kinds of fuel.

Springs.— Bundles of steel plates placed one on top of the other and bound together at the middle by metal bands, and their end connected to the equalizing beams, for the purpose of reducing the effects of the shocks delivered to the locomotive by inequalities in the smoothness of the track. In order to place the weight of the locomotive on the axle-boxes of the driving-wheels, the axle-boxes are arranged to slide up and down in the "jaws" formed by the legs of the frames, and the springs are placed on -shaped saddles which rest on top of the axle-boxes. The frames are then suspended to the ends of the springs by rods called "spring-hangers."

Spring-balances.— The spring attachments in the cab which connect the safety-valve levers to the top-sheets of the boiler.

Stack-base.— The lower part of the smoke-stack, by which the stack is attached to the top of the smoke-box. In some forms it is provided with a hand-hole through which the accumulation of sparks may be conveniently removed.

Stand-pipe.— See Steam Pipe.

Stay-bolts.— The bolts screwed through the inner and outer shells of the fire-box at frequent intervals, usually about four and a half inches apart, to connect the shells together and enable them to resist the full pressure of the steam.

Steam-chests.— The boxes located on top of the cylinders, and which contain the slide-valves through which the steam is admitted to the cylinders. A steam-chest usually consists of two castings — the "steam-chest casing" which rests on the top of the cylinder casting to which it is united with a steam-tight joint, and the "steam-chest casing cover," made of cast-iron and

Steam-gauge.— A gauge attached to the back end of held down by bolts screwed into the cylinder casting. the boiler, in the cab, to indicate the pressure of steam per square inch in the boiler.

Steam-pipe.— The pipe through which steam is conducted from the boiler to the steam-chests, thence through the openings in the seats of the slide-valves to the cylinders. Starting at the dome, the pipe makes a bend called the "throttle-pipe"; then it extends vertically downwards until it clears the vertical walls of the dome, this vertical part is called the "stand-pipe." The stand-pipe is connected to the "dry-pipe" which extends to the top of the smoke-box where it is connected to the "T-pipe," the branches of which are connected to the "arch-pipes" or "steam-pipes" connecting with the steam-chests.

Steam-ports.— See Receiving-ports.

Steam-valve.— The valve inserted in the steam-pipe connecting the boiler with the injector.

Stuffing-boxes.— The chambers in the back-heads of the cylinders, through which the piston-rods move.

Supply-ports.— The openings in the steam-chests through which the steam is admitted from the steam-pipes.

Suspension-stud.— The pin by which the link-hanger is attached to the link-saddle bolted to the link.

Swing-bolster.— A swinging bearing in the centre of the truck on which the forward end of the locomotive rests, and which enables it to run around curves easily.

T or Nigger Head.— See Steam Pipe.

Tender.— The carriage coupled to the back end of the locomotive, and used for the purpose of carrying water and fuel.

Throttle.— The manner in which the steam is admitted to the steam-pipe leading to the steam-chests. It is effected by means of double poppet-valve called the "throttle-valve," placed in the throttle-pipe near the top of the dome. This valve is operated by the engineer by means of a lever called the "throttle-lever" located in the cab, and connected by a rod called the "throttle-stem" to the lower arm of a bell-crank" called the "throttle bell-crank" the other arm of which is connected by a rod to the throttle-valve.

Tires.— The steel bands which form the peripheries of the driving-wheels.

Trailing-wheels.— The back pair of driving-wheels in a four-coupled wheel arrangement, or a small pair of wheels placed behind the main driving-wheels where only one pair of driving-wheels is employed. In either case they are located far enough back of the main driving-wheels to provide the necessary room for the fire-box between the two axles.

Train-pipe.— See Brake Pipe.

Truck or Engine-truck.— The frames, wheels, springs, swing-bolsters, etc., which support the weight of the front of the locomotive. It usually consists of two pairs of wheels held in a frame separate from the main-frame, and attached to the locomotive by the king-bolt or centre-pin, which passes through the "truck centre-casting" and makes a flexible connection, somewhat like the arrangement by which the front axle of an ordinary wagon is attached to the body, which allows the truck to turn about the king-bolt, and thus enables the locomotive to run around curves easily.

Truck-brake.— The air-brake equipment of the truck, as distinguished from the air-brake equipment of the driving-wheels.

Truck Centre-casting.— The cast-iron plate which is bolted rigidly to the transverse bars fastened to the sides of the truck-frame. In a swing-motion truck, the centre-plate is suspended from the transverse bars by links which allow it to swing transversely to the direction of the rails. The king-bolt or centre-pin passes through the centre-plate, and is in some cases provided with a key under the centre-plate, to prevent the locomotive from jumping off the track when running over a rough road-bed.

Tubes.— See Flues.

Tube-sheets.— The plates at the front and back ends of the boiler in which the tubes or flues are inserted.

Tumbling Shaft.— See Lifting Shaft.

Valve Parts.— See Slide-valve.

Valve-yokes.— The wrought-iron or steel bands placed around the slide-valves in the steam-chests, and to which the valve-stems are attached.

Waist.— The cylindrical portion of the boiler.

Waist Sheet.— A sheet of wrought-iron bolted to the waist by an angle-iron, to which the guide-braces, guide-bearers, and cross-ties are attached.

Water-pipe.— The pipe to which the feed-pipe hose is connected.

Water-tubes.— Tubular grate bars used in the water-grates of furnaces burning Anthracite coal. They consist of wrought-iron tubes about two inches in outside diameter, which are attached to the front and back ends of the fire-box at such an inclination as to allow a continual circulation of water through them to keep them cool and thus prevent them from being burned out by the intense heat.

Water-valve.— See Injector.

Whistle-rig.— See Signal Whistle.

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Locomotive Engine, The. In the course of three quarters of a century, a vast wilderness on the American continent has been changed from gloomy untrodden forests, dismal swamps and pathless prairies into the abode of a high civilization. Prosperous states teeming with populous towns, fertile farms, blooming gardens and comfortable homes have arisen from regions where savage men and wild animals united to maintain sterile desolation. The most potent factor in this beneficent change has been the operation of railroads by the locomotive engine.

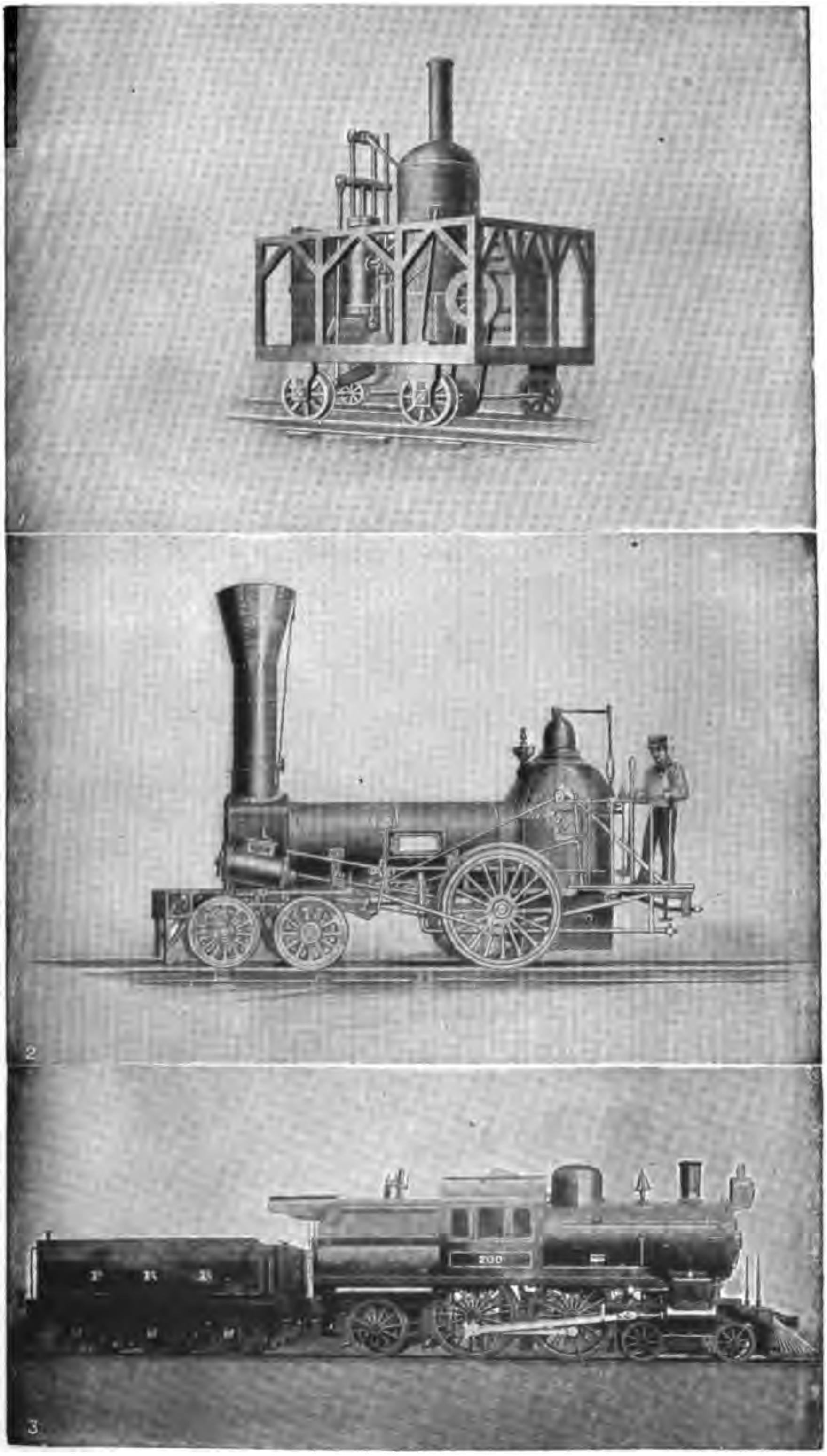
Importance of Easy Means of Intercommunication.— Easy means of intercommunication have been properly encouraged by all nations and races that ever have made material progress in the arts of civilization. Lord Bacon says: «There are three things that make a nation great and prosperous — a fertile soil, busy workshops and easy conveyance of men and animals from place to place.» That opinion was founded upon an intimate knowledge of the world's history; knowledge of the forces, the institutions and the conveniences that contributed to make nations great.

The need of improved methods of transportation, which so long oppressed the human race, did not produce the steam engine. Grim necessity brought it forth when great properties were falling into ruin, because sufficient animal power could not be concentrated to perform stupendous efforts in limited space. The steam engine was invented when horses could not do the work of pumping water out of valuable mines 500 feet deep. It was a foregone conclusion that the steam engine would be applied to locomotive purposes as soon as increasing business rendered animals unequal to the task of supplying necessary motive power on roads and on water ways. See Railway Transportation.

Slow Evolution of the Steam Engine.— After a practical steam engine was put to work on the simple operation of driving a pump, it took half a century of invention to develop it into a motor suitable for driving manufacturing machinery; another half century passed before inventors seriously began the attempt of building a steam engine that could be used to propel a vehicle on land. Far-seeing, progressive men who kept themselves informed on leading inventive achievements were convinced long before steam was applied to land transportation that peripatetic steam engines would be forthcoming when sufficiently urgent necessity would arrive.

When the 19th century opened, Great Britain, more than any other country, needed the use of the steam engine for help in land transportation. Tedious delay occurred before the mill driving engine was applied to vehicles, the principal obstacle being the weight of the ponderous slow moving condensing steam engine which James Watt (q.v.) developed and made popular. A new type was required which in due time was invented by Oliver Evans (q.v.), an American, and utilized by various British engineers. Evans had struggled to interest his own countrymen in his high pressure steam engine but they failed to recognize its merit and refused to aid the inventor. He sent drawings to Europe, hoping that he would be more fortunate with European capitalists. His designs fell into hands that returned no recompense or acknowledgment, but they were used to guide others in building engines that were used for land propulsion.

First Attempts to Produce a Steam Locomotive.— Early in the eighteenth century a variety



1 American Locomotive of 1830.
2. American Locomotive of 1840.
3. American Locomotive of 1900.

of attempts were made in England to produce a steam locomotive. Richard Trevithick (q.v.), a Cornish mining engineer, built several steam carriages for common roads and one engine to run on rails, but they were all failures although they possessed the elements that would have produced a successful locomotive in the hands of a persistent inventor. The first man to build a locomotive to run on rails and haul cars regularly was William Hedley, chief engineer of Wylam colliery on the River Tyne, near Newcastle, England. His first engine was not a success but his experience with its shortcomings enabled Hedley to build a second locomotive which worked fairly well, and is now to be seen in the South Kensington Museum, London, bearing the name of "Puffing Billy."

This engine (figure 1), which was built in 1813, had a return flue boiler, had upright cylinders and was a sort of grasshopper type of locomotive, which under a variety of modifications became the fashion and held the field up to 1829, when the directors of the Liverpool and Manchester Railway offered a prize for a locomotive that would fulfill certain practical requirements. A variety of locomotives were entered for competition and the prize was awarded to the "Rocket," made by George Stephenson & Son. This engine gave a new type of locomotive to the world which by mere increase of size is the locomotive of the 20th century.

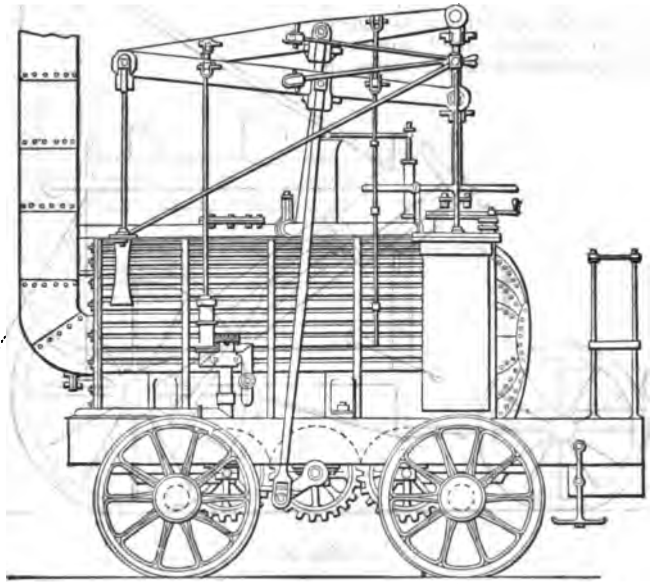


Fig. 1.

Essential Elements of a Locomotive.— The elements combined to make a locomotive engine successful are a boiler that will generate steam rapidly and simple mechanism that will transmit the power directly to the driving wheels. The Rocket had a multitubular boiler, combustion being stimulated by exhaust steam passing through the smoke stack; and the cylinders transmitted the power to the driving wheels without the intervention of any useless beams or rods and the mechanism could be easily handled by one man.

The Rocket (figure 2) was a four wheel engine, the front pair being the drivers, to which power was transmitted from two outside cylinders placed diagonally across the boiler pointing backwards. The first improvement made was to drop the cylinders to nearly a horizontal position which was followed by the cylinders being placed in the smoke box transmitting the power through a cranked driving axle. Most of the locomotive builders in Great Britain readily recognized the merits of the simple form of engine introduced by the Stephensons and they proceeded to develop the motor on similar lines.

Stephenson's Rocket.—There was no original feature about the Rocket, all the elements having been previously employed by other engineers, but the combination was the work of a master mind and gave to George Stephenson, (q.v) the reputation of being the inventor of the locomotive which is more than his due. When the locomotive is closely analyzed, we find that no proof exists of George Stephenson having invented anything which became a permanent attachment. The tubular boiler had been applied to a boiler by Marc Seguin, a French railway master mechanic, several years before the Rocket was built, they were used in the United States in marine boilers before Stephenson's time, and the steam jet in the chimney had been used by Trevithick, Hedley, and others. But if Stephenson was deficient in inventive attributes he had the faculty of knowing a good thing when he saw it. He was one of the first men in Great Britain to realize that there was a great future for the steam engine as motive power for land transportation and he persisted in promoting the interests of the locomotive when it had few influential friends. Stephenson was a good representative of the best type of Englishmen. Opinionated and ever pushing his opinions with bull dog tenacity, he made weaker minds yield before his views on railways and locomotives. This was his hobby and he rode it so furiously that the British world was drawn along often against its will. By his dominant will, persistent determination and forcible arguments, he prevailed on British capitalists to construct an expensive railway for general transportation and induced them to try locomotives when all the scientific world insisted that locomotives were impracticable. He gave his country the glory of originating steam operated railways at the moment when America was almost ready to grasp the prize of honor.

Within a year after the Liverpool and Manchester Railway was opened, a host of other railway enterprises were in progress. The first locomotive almost universally used at that time was carried on four wheels, one pair of small carrying wheels close to the smoke box and one pair of driving wheels in front of the fire box. The boiler was about nine feet long and included an internal fire box about three feet long. The furnace in the Hedley and other early locomotives was located in the internal flue, which in some cases provided the whole of the heating surface; in other cases an addition of a return flue was made. When the Rocket was designed it was determined to employ small tubes to convey the heat of combustion to the water in the boiler, a change which involved the use of a fire box as a furnace. That was made of rectangular section with flat walls which had to be strongly stayed to the outside shell, a water space being provided between the two surfaces. A smoke box with length about one quarter the diameter of the boiler was provided for the passage of the fire gases on their passage to the chimney. In the smoke box was located the opening of the steam exhaust pipe pointing straight through the center of the chimney and acting as a draft inducer. This combination of a multitubular boiler, a fire box surrounded by water and an exhaust steam jet located in the smoke box form the combined elements which make a high speed locomotive a possibility. They were first used together in the Rocket.

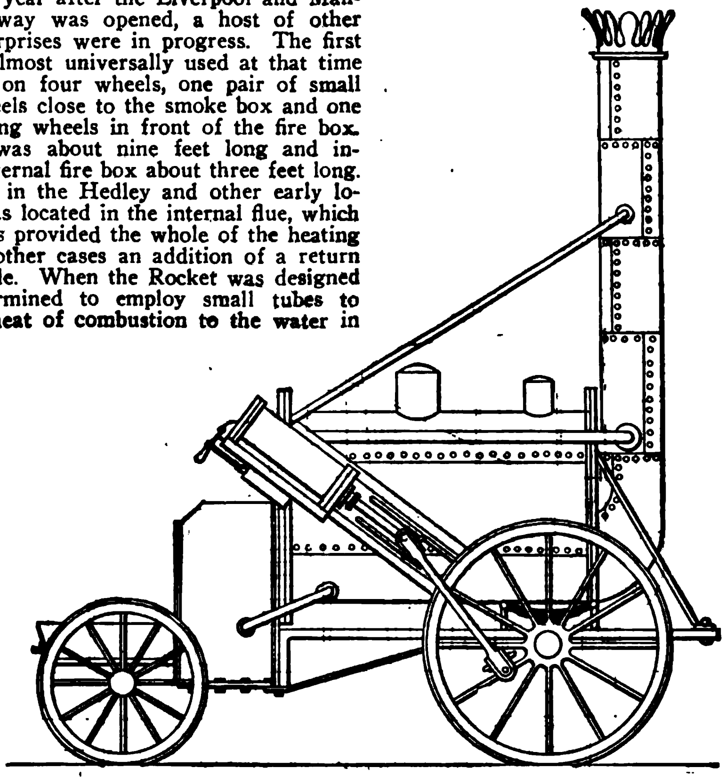
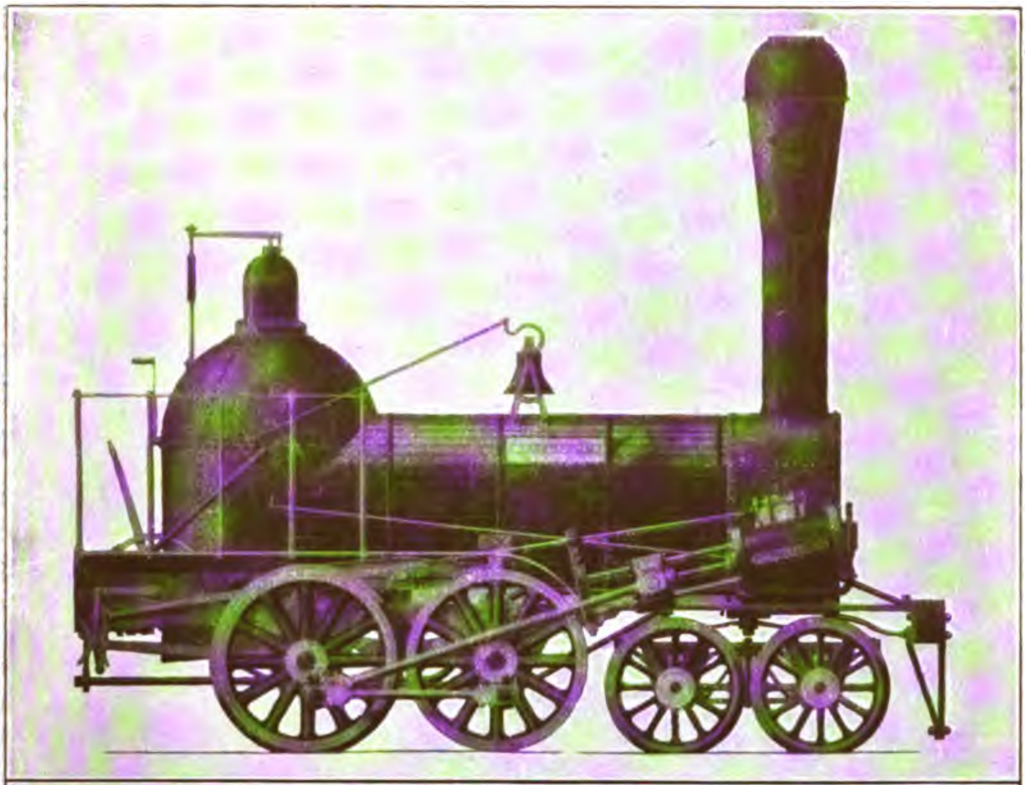


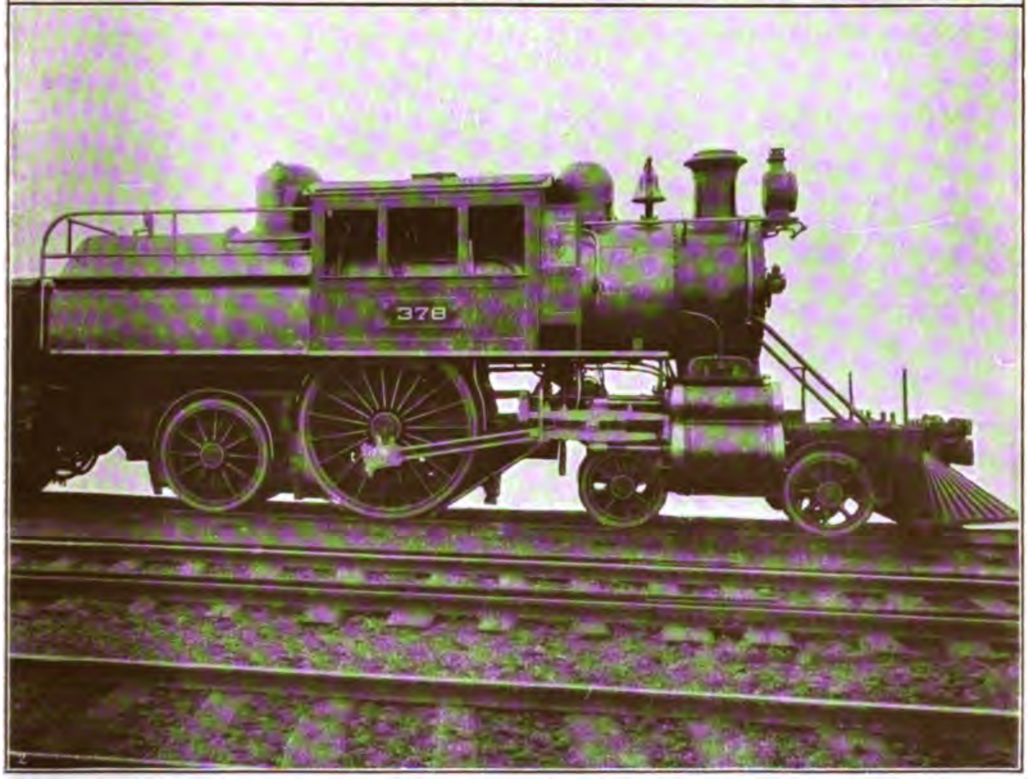
FIG. 2.

Development of the Locomotive in Europe. — The line of development exerted upon the locomotive was increasing the number of wheels and the proportions of boiler cylinders and running gear. In Europe the engine was at an early day provided with a pair of carrying wheels under the foot plate. The wheel arrangement then was one pair of small carrying wheels in front, a pair of large driving wheels in the middle and a pair of carrying wheels behind. It made a conveniently simply arrangement for light trains. When the single pair of driving wheels were found insufficient to provide the necessary adhesion, coupled driving wheels were introduced. For freight service European locomotive designers at an early day introduced the use of three pairs of wheels coupled without any carrying wheels. That remained almost the universal practice until about 1900 when four pairs of driving wheels coupled began to find favor. On railways on the continent of Europe, British practice was closely imitated for years but in some cases very heavy multi-coupled wheel locomotives were used for freight service. In the British Isles inside cylinders were preferred with a plain slide valve operated by a link motion; on the Continent outside cylinders found most favor and articulated valve motion is more in favor than the link motion.

Genesis of Railroads in America.—The movement in favor of building railroads began in the United States about the same time as it began to influence public opinion in Great Britain. The 19th century had not advanced many years when people in the United States commenced to realize the urgent necessity for good arteries of intercommunication as a means of developing the extensive unsettled territory of the country. Statesmen were aware that the immense regions comprising the Roman Empire had been tied to the central government by a system of magnificent roads. There are numerous long reach-

LOCOMOTIVES.





1. Gowan and Marx Locomotive, 1839.
2. Modern High-speed "Bicycle" Locomotive.

ing navigable rivers and there are a great many inland lakes on the American continent, but geographically they are far apart and there is no means of reaching vast regions except by land transportation. A series of Appian Ways was the solution of land travel advocated by political leaders. To the ordinary thinker a system of macadam roads would have solved the difficulty; but such roads were not made to any great extent, for the cost of making them was beyond the means of a thinly populated country where material for road making was frequently very scarce. An agitation in favor of providing a system of canal for inland transportation led to the construction of a great many artificial water ways (see CANALS), but they proved to be a great disappointment. The world of the infant republic could not hold its pace to the speed of the slow moving canal boat, which was prostrated by frost a large part of the time. Some better means must be found to move the increasing volume of merchandise and grain and coal and ore to the centers of consumption. The pinch of necessity wonderfully quickens the inventive faculties. Long before a mile of railroad was built in the United States, the seers, the men of penetrating vision, were discussing the possibilities of the steam engine as a means of accelerating land travel. The high pressure steam engine had been invented by Oliver Evans (q.v.), a native of Delaware, as an improvement of the Newcomen engine. Associated with the Evans engine were ideas of portability that were suppressed in the presence of Watts' ponderous slow-moving engines.

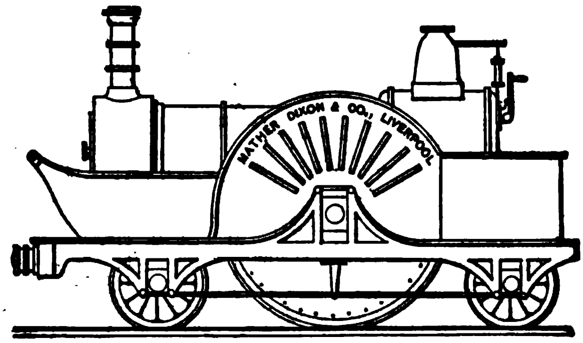


FIG. 3.

Colonel John Stevens (q.v.), a very influential American citizen, as early as 1812 advocated the use of railroads and in that year published a pamphlet on the superior advantage of Railways and Steam-carriage and Canal Navigation in which he outlined schemes of construction which were not greatly deviated from when actual railroad building commenced. The views of Colonel Stevens began gradually to have supporters and the sentiment in favor of railroad building spread slowly.

Baltimore and Ohio Railroad.—The first practical move of any importance was the building of the Baltimore and Ohio Railroad which was chartered in 1827 and partly opened in 1830. Other railroads were under construction at the same time and 1830 may be noted as the natal year of the American locomotive. Little was known anywhere about locomotives when railroad construction was inaugurated in the United States. Crude forms of locomotives had been used in the north of England for about fifteen years but even the scientific world of Great Britain knew almost nothing about them. It is not then surprising that Americans as a rule knew very little about what foreigners had done when they began building railways and their first locomotives were purely of original design. Very little accurate information had reached America concerning what had been done abroad before our people proceeded earnestly with the building of railroads. Before the railroad era there was scarcely any means of circulating scientific information, and few Americans had any idea of how railroads and the motive power for operating the same ought to be built, but that was considered no obstacle; they proceeded vigorously to construct railroads, learning the business over many expensive mistakes. The nation has always been noted for self-reliance, and the pioneer railroad builders pushed along without hesitation, crossing the bridges of difficulty when they were reached. When a portion of the Baltimore and Ohio Railroad was ready for business in 1830, few people believed that locomotives could be built that could operate the road which was remarkably crooked. Popular belief was that hauling railroad cars would be a new line of enterprise for the mule that had supplied motive power to the canals. But Peter Cooper (q.v.), a merchant of Baltimore, considered that the use of steam was essential to make railroad operating a success and he had a small locomotive built to prove the faith that was in him. His engine, the "Tom Thumb," was little more than a model but it developed one and a half horse power and proved that a steam locomotive could be used in operating around very short curves.

Cooper's "Tom Thumb."—The Tom Thumb has an upright multitubular boiler but no claim for originality was advanced for it, as Nathan Read, of Warren, Mass., had patented such a boiler in 1791. The single cylinder was upright and transmitted power to the driving axle through a gear wheel. The engine performed the work for which it was built and for a time its form exercised considerable influence on the designing of American locomotives. Shortly after the experiments were made with Peter Cooper's model, the Baltimore and Ohio Railroad Company advertised, offering a premium of $500 for a locomotive built in the United

States which would meet certain specified conditions. The offer brought to the company five locomotives all built at different places, all of original design and all of them practical engines. That which was selected was built by Phineas Davis, of York, Pa. It had upright boiler and cylinders, after Cooper's idea, and was the first in America of a class of engines called "grasshoppers" that were a familiar feature on the Baltimore and Ohio Railroad for many years. The upright boiler and cylinders did not appeal to the mechanical men of other railroads. Most of them had engines built with a horizontal boiler resting on an oblong frame which carried the cylinders and secured the running gear. Even the small engines resting on four wheels were found to act injuriously upon the slender track of the pioneer railroads and the first important improvement effected by American engineers was putting the weight upon three pairs of wheels, two pairs forming the leading truck. This was done in 1832 by John B. Jervis (q.v.), chief engineer of the Mohawk & Hudson Railroad. That leading truck soon came to be a regular feature of American locomotives.

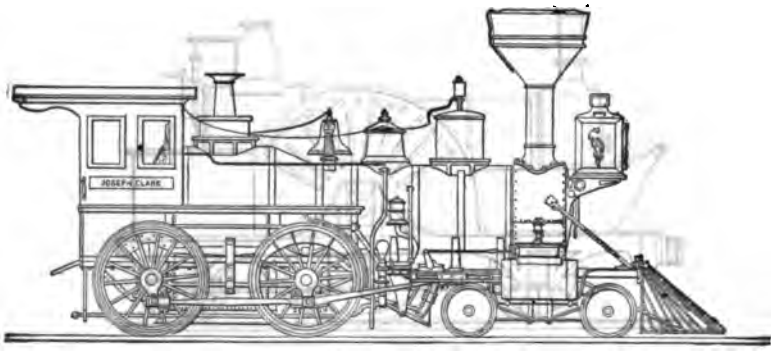


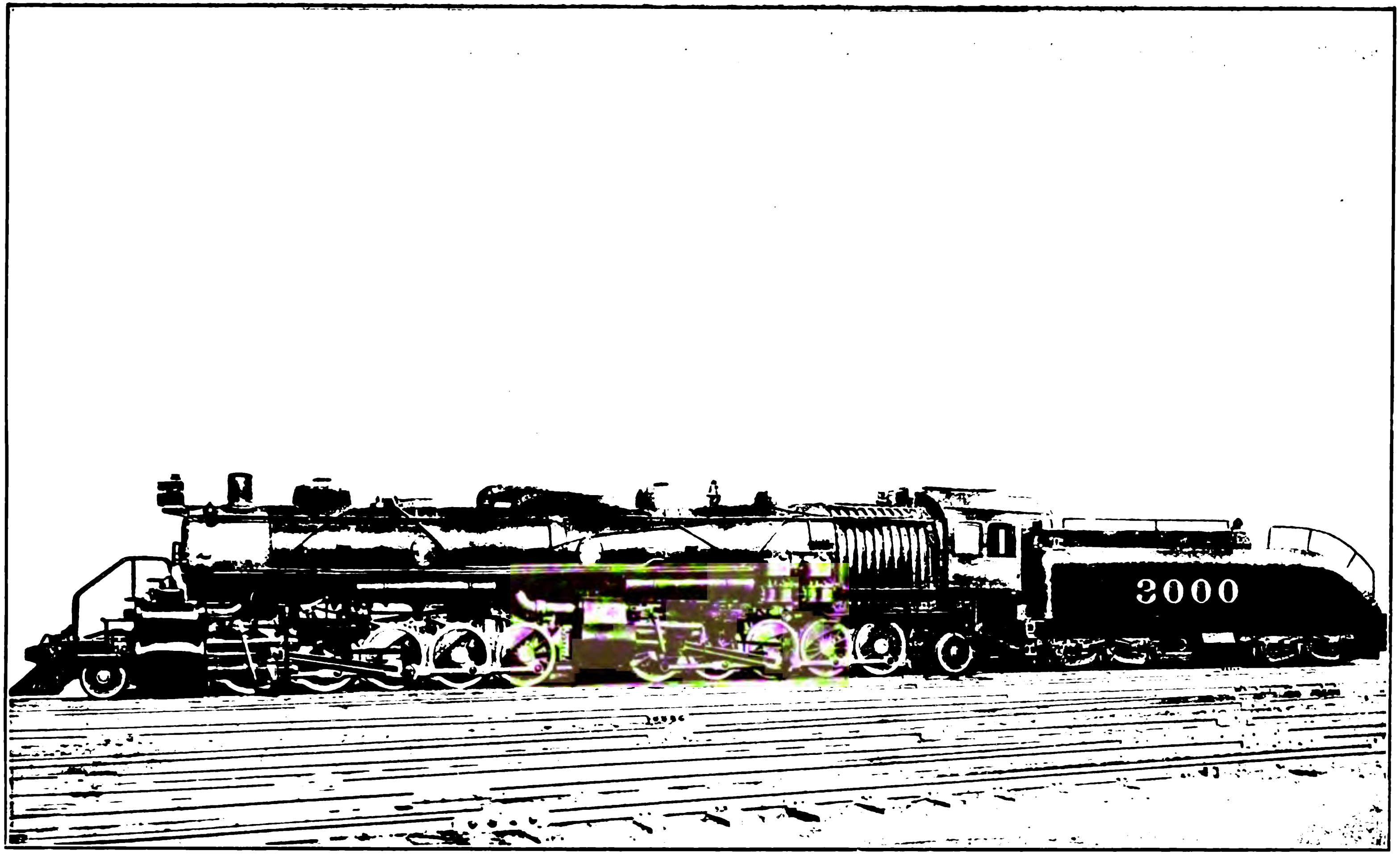
Fig. 4.

Jervis Invents the Four Wheel Truck.— The course of evolution of the American locomotive turned upon methods of making the engines more powerful with due regard for the weakness of the rails the trains had to run upon. For about 20 years after the first locomotive was put to work in the United States, the design worked out by Jervis of a single pair of driving wheels and a four-wheel truck was the prevailing type. Then another pair of driving wheels was added, these being coupled to the main driving wheels, making what was long known as the American locomotive (figure 4). An important improvement effected upon this engine was placing equalizing beams between the driving wheels, which modified the shocks given by imperfect track.

The railroad companies having the haulage of coal, metals and other heavy freight began about 1850 to introduce locomotives of much greater power than the eight-wheel engine and those with six coupled wheels worked gradually into favor. Some companies used six-wheel connected engines without any carrying wheels; but the favorite heavy engine for many years was known as a ten wheeler, its arrangement being a four wheel truck and three pairs of driving wheels coupled. Then came the mogul engine, which had a pony truck in front consisting of a single pair of wheels and three pairs of driving wheels connected. This gave the means of using a greater proportion of the weight for adhesion than was practicable with a ten wheel engine of the same weight.

Working Out Details.— For many years American railway master mechanics worked on making a locomotive as simple as possible, and the working parts were so proportioned and arranged that the repair expenses would be as low as possible. Various forms of running gear and foundation supports were tried; wooden frames, combined wood and iron frames, outside and inside frames made of iron plate or of iron bars. The fittest to survive were inside iron bar frames which for one decade before the 20th century began were gradually giving way to cast steel. The boiler material for many years was iron with, in some instances, copper fire boxes and brass tubes. The fuel used for the first 40 years of the railroad era was almost exclusively wood, but that became so dear in some quarters that the burning of coal had to be introduced. When that was successfully accomplished it was found that copper fire boxes and brass tubes wore rapidly from the attrition of the hard particles of the coal. This led to the universal introduction of iron for fire boxes and tubes. The heat generated in a coal burning fire box is so intense that it was found to create blisters and flaws in the imperfectly welded iron. After much careful manipulation a mild form of steel was produced that proved a safe, strong and durable material for fire boxes. When this fact was satisfactorily demonstrated steel took the place of iron and it is still the only material used for locomotive fire boxes on the American continent. The successful use of steel fire boxes led to the same material being used for boiler shells. There again it proved itself superior to iron and all locomotive boilers are now made of mild steel.

The lines of progress then pursued by American railway mechanical engineers were: maintaining simplicity of parts while increasing the proportions for the purpose of making the locomotive sufficiently powerful to meet the requirements of fast and heavy trains. The fragile track over which the early lomotives were operated called for extraordinary care in reducing as far as possible the shocks resulting from the moving of the power-producing machinery, and of the running gear. Counterbalancing the driv-



SANTA FE MALLET FREIGHT LOCOMOTIVE, THE LARGEST IN EXISTENCE.

This huge locomotive was enlarged at the Santa Fe shops from an existing locomotive by adding the superheater and feed-water heater sections. The engine weighs 308 tons, the tender 117 tons, making the total weight 425 tons. Its length over all is 120 feet 7½ inches. The H. P. cylinders are 28 inches dia.; the L. P. are 38 inches dia.; the common stroke is 32 inches. The max. drawbar pull is 111,000 pounds. The fire-box has 204 square feet of heating surface, and the tubes 3,625 square feet. The gases next pass through the tubes of a superheater of 2,318.4 square feet surface and then through a feed-water heater of 2,659.5 square feet. The steam passes from the steam dome to the superheater; through the high-pressure cylinders; back to the low-pressure superheater; through the low-pressure cylinders, and to the exhaust stack.

ing wheels and reciprocating parts of the engine received the greatest possible attention, and equalizing beams were introduced at an early day to distribute evenly among the wheels and springs the concussions caused by low joints and other defects of the track. Steel wheel tires that are almost immune from breakage gradually took the place of cast iron and wrought iron, which were originally employed exclusively for tire-making. Experience and theory both having demonstrated that high boiler pressure was necessary to produce economical use of fuel, a high quality of steel was produced for the construction of boilers and furnaces, with the most gratifying results. Steel boiler tubes have taken the place of copper, brass, or iron, and failures from this troublesome part of a locomotive boiler have been reduced to the lowest limits. Not a small part of the increased efficiency of boilers is due to highly perfected appliances provided for feeding the water. Injectors that can be regulated to supply exactly the volume of feed water required have pushed out of service the erratic and unreliable force pump, a change which protracts the life of the boiler by obviating extremes of temperature.

Although it was of the utmost importance for the safety of the public, and of every one connected with the operating of the locomotive, that the boiler pressure should be maintained below a certain tension, serious defects were long common in the construction of safety valves, with the result that boiler explosions were painfully common. In fact, one of the pioneer railway companies advertised that it kept a car loaded with cotton bales next to the engine to prevent passengers from being injured when the boiler exploded. That source of danger has gradually been eliminated, and modern safety valves may be depended upon to prevent the steam pressure rising more than two or three pounds per square inch above the blowing-off point.

The efficiency of the engine has been decidedly improved by setting the cylinders horizontally, thereby providing for direct transmission of power in line with the axles.

In the pioneer days of locomotive building, very little attention was bestowed upon the lubrication of valves and cylinders, an intermittent charge of tallow being considered sufficient, a practice which led to serious loss of power through excessive friction. The attention of inventors was directed to this defect of the locomotive, and a long line of patented lubricators were produced. The latest appliances for lubricating valves and pistons are now so efficient that a constant supply of lubricant is assured.

For many years after locomotives came into use great efforts were made and much expense incurred in giving the engines an ornate appearance. That fashion was gradually abandoned, and severe simplicity of form and modest coloring is more consonant with the character of the modern locomotive.

Sixty-Miles-an-Hour Engines.— When the locomotive had been in use in this country about 20 years, there arose an agitation for engines that would maintain a speed of about 60 miles an hour. Under this demand a number of locomotives were built with a single pair of driving wheels, but the movement toward high speed was short lived. Most of these high speed engines resembled the English engine, figure 3. The designers of such engines appeared to think that the size of cylinders and driving wheels formed the measure of the speed capacity of a locomotive, but dearly bought experience taught them that the real controlling element is the size of boiler, which, in the engines referred to, was very small. For many years the growth of the locomotive was restricted by the comparatively fragile iron rail. The iron rail wore so rapidly and laminated so badly under heavy or sharp wheel impact, that prudent railroad managers generally restrained other officials in their zeal to increase the hauling power, and therefore the weight, of their locomotives. Until steel rails were introduced the subject of wear of rails was one of extraordinary solicitude to railroad managers.

Steel Rails.— In 1870 steel rails were beginning to be appreciated for their extraordinary wearing qualities. That time may be regarded as the beginning of the movement toward making the locomotive as powerful as it is possible to make a motor which has to run on a rail gauge of 56½ inches and pass under bridges and tunnels about 15 feet high. In 1870 the vast majority of locomotives in the United States were of the eight-wheel or American type, with cylinders 16 x 24 inches, driving wheels 60 inches in diameter, heating surface 900 square feet, grate area 12 square feet, total weight 50,000 pounds. Such an engine was used for all species of service, and was justly considered the best all-round locomotive that had even been employed. The wear-resisting steel rail has permitted locomotive builders to develop the eight-wheel engine until it has become common to carry 20,000 pounds on each driving-wheel, and as much as 25,000 pounds per wheel has been tried. That was beyond the limit of cool journal impact and led to the introduction of more driving-wheels, or a pair of carrying wheels under the foot plate in the highly popular locomotive known as the «Atlantic» or 4-4-2 type.

Increasing the Boiler Capacity.— The development of the boiler to supply steam to cylinders as large as 23 x 32 inches was the result of very skillful and ingenious labor performed by the most accomplished locomotive designers in the country. To produce a boiler of liberal steam-generating capacity it was necessary to increase the grate area. With the eight-wheel engine, which became the object of development, the fire-box was between the frames and the forward and back driving axles. Under these conditions the width could not be more than 34½ inches and the length 72 inches, so that little more than 17 square feet of grate area could be secured. When attempts were made to force these small fire-boxes to their utmost, it became a common practice to urge the fire with such intensity that from 100 to 200 pounds of coal per square foot of grate area would frequently be burned per hour. This was done with great waste of fuel and with destructive effects upon the fire-box. The necessity for an abnormally large grate to burn anthracite coal induced James Millholland, superintendent of motive power of the Philadelphia & Reading Railroad, in 1857, to place the grate above the frames, which gave a material increase of grate surface. Zerah Colburn, in 1854, designed some engines for a road which is now the Delaware, Lackawanna & Western Railroad, with fire-box 7 feet 6 inches wide and 6 feet long, providing 45 square feet of grate area. These fire-boxes were entirely behind the driving wheels, and the engines were not adapted to anything except very slow service. Millholland modified the Colburn design in a boiler patented in 1862. This boiler had an overhung fire-box, a combustion chamber, and other features that enabled it to burn anthracite coal successfully. In 1877 John E. Wootten, general manager of the Philadelphia & Reading, patented a boiler with a fire-box extending over the driving wheels, which was practically the first of a type now largely used. The circumstances which influenced the designing of boilers with very large grate surface did not move the railroad men in charge of bituminous coal-burning engines until after the advent of steel rails. The rapid increase in the capacity of locomotives that followed the improvement in the track compelled the locomotive designers to devote attention to the increasing of the grate area. This induced them to adopt Millholland's plan of putting the grates above the frames, and to making them as long as possible consistent with the ability of a fireman to cover the front part with fuel. The limit of burning a moderate amount of coal per square foot of grate was again soon reached, because demands for more powerful locomotives continued, and the physical limit imposed by bridges and permanent structures still left some possibility of increasing the size of the engines. The next step to provide a fire-box with increased grate area was made by the Baldwin Locomotive Works in 1895 by the introduction of the «Atlantic» type, 4-4-2, designed by S. M. Vauclain. In that form the fire-box may be made as wide as a sleeping-car, which enables the designer to use a grate large enough for any locomotive that can be built to meet the restrictions of track and bridges, and may be regarded as final under existing conditions.

Introduction of Compound Locomotives.— American railroad managers have never been exacting in putting restrictions upon the amount of fuel used by locomotives, regularity of service and freedom from break-downs being considered of most importance. But so much had been said and written about the reduction of fuel expense that might result from the introduction of compound locomotives (see LOCOMOTIVES, COMPOUND), that various railroad companies began about 1890 to purchase engines of that character. In this year of grace 1904 there are probably 10,000 compound locomotives in use in North America. There are a variety of types, two-cylinder compounds with high pressure cylinder on one side and low pressure cylinder on the other. The four-cylinder Vauclain compound is more numerous than all the others combined. It has two cylinders on each side transmitting the power through a single cross-head. There are a few tandem compounds in use that have two cylinders in line on each side; and there are a few four-cylinder compounds with two of the cylinders outside on the frames and two cylinders below the smoke-box, the latter transmitting the power through cranked axles. This type of locomotive promises to become the most efficient type for heavy passenger train service. The compound locomotive has not achieved real popularity with railroad men, and, so far, the purpose of their introduction has not been fulfilled. They have not performed the work of hauling trains at less expense than the simple engine.

About 20 per cent of the fuel placed upon the tenders of locomotives is used for other purposes than that of hauling trains. Part of that is used for raising steam, part for keeping the boiler hot when the engine is not working, and part is wasted through the safety valves and other sources of leakage. This leaves only 80 per cent of the fuel used as a basis for saving by compounding or other improved methods of using steam. The weight of evidence goes to show that the saving effected by compounding is about 8 per cent. If a compound locomotive is not capable of running as many miles per year as a simple engine, a charge of inefficiency will stand against it. Railroad managers complain that the compound loses mileage as compared with a simple engine, and that it is more expensive to keep in working order, so that the saving of fuel is generally overbalanced by other expenses.

Efficiency of Fuel.— An ordinary locomotive develops one horse-power for from 12 to 15 minutes per pound of coal burned in the fire-box equivalent to four or five pounds of coal per horse-power per hour. Engines worked under particularly favorable circumstances may double the duty per pound of coal consumed, while others again will not produce one horse-power short of six or seven pounds of coal per hour. Under favorable conditions a locomotive compares fairly well with a good stationary engine, under the unfavorable conditions of being forced so that the steam passes out of the cylinders at nearly steam-chest pressure, no measure of economy ought to be expected. Predictions are rife that the days of the steam locomotive are numbered, and that electric power generated cheaply in huge central stations will in the near future move the passenger and freight trains now drawn by toiling locomotives. This prophecy may be true, but when the last steam locomotive is consigned to the scrap heap or to the Smithsonian Institution, it will be well to credit it with having performed noble service to the human race.

Reduced Cost of Transportation.— As motive power for the transportation of freight and passengers, the locomotive has steadily increased in efficiency ever since Cooper's «Tom Thumb» wound around the sharp curves of the Maryland hills. At the time that feat was performed the cost of moving flour from Columbia to Philadelphia over a State-made turnpike was 13.51 cents per ton per mile. Transportation was so expensive in regions remote from water carriage as to be prohibitive except for articles of special value. In 1823 John Stevens, of Hoboken, obtained from the legislature of Pennsylvania a charter to build a railroad from Philadelphia to Columbia, in which he was authorized to charge 7 cents per ton per mile. In 1870 the charge for a bushel of wheat per rail from Chicago to New York was 26.11 cents. Under the influence of steel rails and heavy locomotives the rate per bushel of wheat from Chicago to New York had dropped in 1899 to 11.6 cents. An item in 'Railway and Locomotive Engineering' says that when the volume of freight was large enough James J. Hill had carried 10 barrels of flour 10 miles for 1 cent. A barrel of flour weighs 196 pounds, so Mr. Hill has carried 1,960 pounds 10 miles for 1 cent, presumably at a profit. The steady decrease in freight rates will be understood by an examination of the annexed table. The distance from Chicago to New York is about 1,000 miles. The figures in the table apply to any territory for the whole or a part of the distance hauled.

RATES IN CENTS PER BUSHEL OF WHEAT AND CORN FROM CHICAGO TO NEW YORK.

Year	Wheat		Corn	
	By rail Cents	By rail and water Cents	By rail Cents	By water Cents
1870	26.11	19.58	24.37	19.32
1880	19.8	15.8	17.48	14.43
1890	14.3	8.52	11.36	7.32
1900	10.8	....	10.1	....
1904	11.4	....	10.6	....

Influence of Steel Rails and Huge Locomotives.— The use of steel rails and huge locomotives has exerted tremendously far-reaching effects and has created social revolutions in certain parts of the world. They brought the cereals of regions west of the Missouri River and of the remote Northwest into competition with the grain-raising districts of the Eastern States and with those of Europe, Africa, and Asia.

While inflicting injury and suffering upon the few, progress as represented by Bessemer's great invention and by the enterprise of American railway master mechanics has exercised a beneficent influence upon the many, and the world at large has been a great gainer from the skill and the enterprise of the inventor of a marvelous system of steel-making, of the American mechanic, of the engineer, of the railroad constructor, and of the railroad manager. They have together built a monument to progress which will always be regarded by a grateful people as one of the highest achievements the world has ever witnessed. ANGUS SINCLAIR, *Editor 'Railway and Locomotive Engineering.'*

Locomotive and Engine Industry. Unlike many of the great American industries the history of the inception and growth of locomotive engineering in the United States may be clearly traced from the day when the first locomotive was run upon the rails of the Baltimore and Ohio Railroad. Other lines of rails had previously been laid but they had been constructed for special purposes, and it was not until 1828, when both the Baltimore and Ohio and the South Carolina railroads were started, that there was any system constructed with the definite object of conveying both passengers and freight. The first American built locomotive was operated upon the Baltimore and Ohio tracks, and, although it was nothing more than the mere working model which was constructed by Peter Cooper in 1829, and was not intended for permanent service, it demonstrated the practicability of the invention so conclusively as to prove to the world that railway lines might be operated by locomotive power. In fact, it was largely due to this successful demonstration that the road was finally completed. If the experiment had failed, the project would have been abandoned.

The Peter Cooper model was a little engine with a single cylinder three and a half inches in diameter, with a boiler that was scarcely larger than that of an ordinary kitchen range, and with tubes that were improvised from gun-barrels. In spite of all the crudities in its construction, however, its trial run was completed so successfully that Peter Cooper, who himself was the engineer, was able to drive his locomotive, which hauled forty-one persons, including himself, at a speed of eighteen miles an hour. Slight as such speed would seem at the present time, it was a great achievement for those days, when the locomotive was so generally regarded as the dream of an impracticable visionary. Moreover, it meant the beginning of the great development of the American locomotive and engine industry.

The first locomotive to be constructed in the United States for actual work was made in 1830. In 1829, however, Horatio Allen had imported a locomotive from Stourbridge, England, for the use of the Delaware and Hudson Canal Company. It was known as the «Stourbridge Lion,» and was the first «real» locomotive ever used in this country. The first distinctively American locomotive, the «Best Friend,» was manufactured to the order of the South Carolina Railroad by the West Point Foundry. Both of these machines were operated successfully.

It was in 1831 that Matthias W. Baldwin, a manufacturer of bookbinders' tools in Philadelphia, was employed by the proprietors of Peale's Museum, in that city, to construct a model locomotive for exhibition purposes. This was the time when the public excitement over the Rainhill contests that had been held in England was at its height, and Robert Stephenson's victory with his «Rocket,» had made the people very curious to witness the operations of such an engine. To gratify this craving for novelty the museum managers built a circular track, and, upon this, the Baldwin locomotive was operated. His model worked so well, however, that the officials of the Philadelphia, Germantown and Norristown Railroad Company engaged him to construct a larger machine for use upon their lines. This locomotive, which was completed in November, 1832, was named «Old Ironsides.» It was a four-wheeled engine, very similar in design to that of the English make, and weighed, when placed on the tracks, a little more than five tons. The rear, or driving wheels, which were fifty-four inches in diameter, were placed on a crank axle; while the cylinders, which were nine and a half inches in diameter, by eighteen-inch stroke, were attached horizontally to the smoke box. The frame was made of wood, while its wheels, which had wooden spokes and rims, were strengthened by the wrought-iron tires and heavy cast-iron hubs. There was no cab, and the tender, which also ran on four wheels, had wooden sides and backs to hold the wood that was required for fuel, and an iron tank, used for carrying water. Roughly made as this locomotive would seem if compared to the beautifully constructed engines of this day, the speed which it was able to attain, with its train of cars attached, was frequently over 30 miles an hour. In September, 1832, the firm of Davis & Gartner, of York, Pa., built three locomotives of the «grasshopper» type for the use of the Baltimore and Ohio Railroad. They were made from designs prepared by Phineas Davis and Ross Winans, and were so serviceable that this style of engine was in use for fully sixty years. Thus, step by step the locomotive industry was developed. By 1834, the building of such engines had extended to many works in several parts of the country, and such pioneers of railway mechanics as Cooper, Allen, Baldwin, Rogers, Norris, Winans, Campbell, and others, paved the way for the greater achievements of Mason, Cooke, Milholland, McQueen, and Hudson, to say nothing of the countless geniuses whose accomplishments represent the modern development of the art of engine building. In the old days, of course, there was no guide that anybody could follow. There was no such teacher as experience. Moreover as there were few skilled workmen, and practically no shop facilities, the pioneer locomotive builders labored under difficulties which make their success remarkable as the extraordinary achievement of indomitable perseverance.

The early American locomotives were so similar in every essential feature to the engines of English make that it seems quite probable that they were constructed as a close copy of that model. Later, however, the American inventive genius came to the front, exhibiting itself in such radical departures from the imported machine that it was no longer necessary to bring locomotives from Europe. Taking these evidences of development step by step the improvements upon the locomotives of English type were reached in about the following order: The four-wheel swiveling truck, or bogie, was substituted for the pair of fixed carrying wheels in 1832; the cross-head pump for supplying feed water to the boiler was invented in 1833; the half-crank driving axle took the place of the crank-axle in 1834; outside connection to the driving wheels was introduced in 1835; the coupling of two pairs of driving-wheels was patented by H. R. Campbell in 1836; the use of counterbalance weights for the revolving and reciprocating parts was perfected in 1837; the use of lap-welded wrought-iron boiler tubes in 1838; of bar-frames of forged iron with forged pedestals, in 1840; the wooden cabs with glass windows originated during the winter of 1840-41, having been invented in New England, where the excessively cold weather necessitated some such protection for the engine-men; the Baldwin flexible-beam truck was invented in 1842; the connection of equalizing beams with the driving-wheels was perfected by Eastwick and Harrison in 1845; the first "ten-wheel" locomotive, with six coupled wheels and a leading four-wheeled truck was used in 1846; the Mogul locomotive, with six coupled wheels and a leading two-wheeled truck came into use in 1861, while the Consolidation type, consisting of eight coupled wheels and a leading two-wheeled truck, an engine which was designed by Alexander Mitchell of the Lehigh Valley Railroad, was first built at the Baldwin Locomotive Works in 1866. Among the other features of the locomotive which have been added from time to time, and all of which appeal to the eye of the foreign manufacturer as peculiarly American inventions, are the pilot, or "cow-catcher," the bell, the boiler covering of planished or Russia iron, the large headlights, and the directness and visibility of the pipes and other appurtenances. Up to within as recent a time as the early fifties the so-called "American" type of locomotive, with its four coupled wheels and its four-wheeled truck, was the class of engine most generally adopted by railroad men in the United States. In fact, ever since the day of its first construction by Campbell, in 1836, it had been continuously used for almost every kind of general service — for the carrying of passengers as well as for freight and switching purposes, and it was not until the demand of the public upon the railways increased so greatly as to create the need of more powerful locomotives that special engines for freight service were constructed. It was to meet these requirements that the Mogul and ten-wheel types were adopted during the sixties, and that the Consolidation engines became the standard for the heaviest freight service between 1870 and 1880. During the seventies the use of iron tires and iron rails of light section — the weight usually ranging from fifty to sixty pounds per yard — restricted the weight per axle to a maximum of twelve tons. About 1880, however, came the substitution of steel for iron in the tires. Later came the steel rails, of the heaviest weight possible, and as railway men had already become convinced of the manifold advantage to be derived from the adoption of larger heating surfaces in locomotive boilers, the weight of the engines began to show a marked increase. If, in the beginning, the building of these excessively heavy engines was largely an experiment, it was not long before their practicability had become so well established that their size and weight continued to increase until cars were made that were capable of carrying loads of 50 tons, and locomotives were constructed with more than 30 tons weight per axle. Such powerful locomotives were more costly and difficult of construction, but when the practicable economies in the matter of transportation which were made possible only by the use of cars of such great carrying capacity were taken into consideration the balance was so strongly in favor of the big cars and the heavy, powerful locomotives that railroad men found no reason to hesitate because of the question of first cost.

Since the beginning of the art of locomotive construction in the United States, American engine designers have been actuated by one desire: To produce a machine with sufficient flexibility of wheel-base to enable it to pass sharp curvature and adapt itself to the unevenness of track surfaces resulting from the action of severe frosts, as well as to facilitate the matter of repairs by striving to make every part so accessible that it might be removed without affecting the other parts of the engine.

Among the locomotive-builders whose experiments have contributed to this result and who have also played an important part in the work of increasing the motive power of the American engine, there are several establishments that have either disappeared altogether or that have discontinued the manufacture of this kind of machine to enter lines of business in which the competition was less intense. To speak of these firms recalls such names as the Norris Brothers of Philadelphia, whose work, in the early days of the industry, presented the most active competition to such builders as Baldwin and Rogers. After many business vicissitudes this firm ceased to exist, in 1865, their plant being incorporated in the Baldwin Locomotive Works. In Baltimore, in the old days, there were two works, those of Ross Winans and the Denmeads. Boston had several plants, notably those of Seth Wilmarth, John Souther's Globe

Works, the McKay & Aldus works at East Boston, and the Hinckley Locomotive and Machine Works, which was one of the representative houses in the industry up to some 25 years ago. In fact, New England has always been a section of the country that was most actively interested in the work of engine building, the principal plants, in addition to those already named, being the works of Ballard Vail, at Andover, Mass.; Corliss & Nightingale, of Providence, R. I., a firm which, although George H. Corliss, the great engine builder, was at its head, proved less successful in the building of locomotives than in other branches of the trade; A. Latham & Company, of White River Junction, Vt.; the Locks and Canal Works, at Lowell, Mass.; the Amoskeag Locomotive Works, at Manchester, N. H.; the Lawrence Locomotive Works, at Lawrence, Mass.; the Taunton Locomotive Works, and the Mason Machine Works, at Taunton, Mass.; and the Portland, Me., Locomotive and Car Company.

Among other sections of the country New Jersey has been a special field for the manufacture of locomotives. The plant of William Swinburne, at Paterson, afterward known as the New Jersey Locomotive Works, and, later, as the Grant Locomotive Works, was one of the offshoots from the Rogers Works. For years it conducted business most successfully, and, finally, in 1885, as the Grant Locomotive Works, when they found that it was impossible to meet the demands of modern requirements with their antiquated shop and their inadequate facilities, they closed their works at Paterson and removed to Chicago, where, after they had reorganized with new capital and thoroughly modern shops, they continued in operation until 1893. The financial depression of that year was too much for them, however, and the entire plant was sold to the Siemens & Halske Electric Company of Chicago. For a time it was operated both for the manufacture of electrical equipment and locomotives, but the business at last proved so unprofitable that the plant was closed. Among the other New Jersey manufacturers of locomotives were Breese, Kneeland & Company, who operated the Jersey City Locomotive Works, and Van Cleeve, McKean & Dripps, whose shops were located at Trenton.

For several years the firm of Eastwick & Harrison built locomotives at Newcastle, Del., and, when they failed in 1840, they were succeeded by the Newcastle Manufacturing Company, a concern that gained both wealth and international fame by their railway operations in Russia. In the West there were several manufacturers of note, some important works being located at Cleveland, Detroit, Milwaukee, Chicago and San Francisco. The Rome Locomotive Works, at Rome, N. Y., started under favorable auspices, but, after several years of more or less disastrous operations, went out of business in 1891.

The Baldwin Locomotive Works, of Philadelphia, has the distinction of being not only one of the pioneers in the business of locomotive manufacture but is still one of the representative establishments in the industry. Established in 1831, by Matthias W. Baldwin, its product has steadily increased until it is now in excess of 200 locomotives a month. The works occupy an area of 20 acres in one of the central parts of the city, and for many years they have given steady employment to more than 15,000 persons.

Another important plant is that of the Rogers Locomotive Works at Paterson, N. J. Founded in 1836, by the firm of Rogers, Ketchum & Grosvenor, the mechanical genius of the concern was Thomas Rogers. When he died, in 1856, the firm was incorporated under the title of the Rogers Locomotive and Machine Works, with Jacob S. Rogers as President, and business was transacted under this name until 1892, when the corporation was again reorganized and when it assumed its present name of The Rogers Locomotive Works. The Rogers Company has an annual capacity of more than 250 locomotives and gives employment to nearly 1,500 persons.

Up to the time of the war with Spain the spirit of consolidation which had already shown its effect in other industries had been an unknown factor in the business of locomotive making. Soon after 1898, however, several of the competing works began to talk of the organization of a larger corporation, or combination, and the movement finally became so popular that, in July, 1901, eight of the large manufactories were consolidated under the name of the American Locomotive Company, with a capital of $50,000,000, half of which is in common stock, and half in 7 per cent cumulative preferred. The works acquired by the organization were as follows:

	Locomotives per annum.
Schenectady Works, Schenectady, N. Y.	450
Brooks Works, Dunkirk, N. Y.	450
Pittsburg Works, Pitsburg, Pa.	200
Rhode Island Works, Providence, R. I.	150
Richmond Works, Richmond, Va.	150
Cooke Works, Paterson, N. J.	125
Manchester Works, Manchester, N. H.	100
Dickson Works, Scranton, Pa.	85
Approximate total capacity	1,710

In March, 1904, the American Locomotive Company also acquired the stock of the Locomotive & Machine Company of Montreal, Limited, with works in Montreal, Canada, engaged in the building of locomotives and structural steel work. By the addition of the Rogers and the Montreal Works the American Locomotive Company now operates ten plants with a total annual capacity of 3,100 locomotives.

In October, 1905, the company extended its field by the organization of the subsidiary company, the American Locomotive Automobile Company, for the manufacture of automobile vehicles, building a factory for this purpose in connection with the works at Providence, R. I.

Of the ten plants the Schenectady Locomotive Works was established by the Norris Brothers in 1848. In 1863 it passed into the hands of John Ellis, who was eventually succeeded by his sons, John C., Charles G., Edward, William D. Ellis, and Walter McQueen.

The Cooke Locomotive and Machine Company of Paterson, N. J., was established about 1800, but, for nearly half a century they were employed almost exclusively in the manufacture of machinery In 1852, however, they began to make locomotives, and, as this branch of their business increased, the old shops were abandoned and new and up-to-date works were constructed.

The Pittsburg Locomotive Works began operation late in 1865. Originally intended as a small shop, its capacity being at first limited to 30 locomotives per annum, they were so successful in placing orders for their product that the establishment now occupies an area of fully

12 acres. In their work of extending their capacity the best of fire-proof buildings have been erected, and the works are equipped with the latest and most improved electric, hydraulic, and pneumatic appliances known to the art of locomotive construction.

The Rhode Island Locomotive Works, at Providence, R. I., commenced operations in 1865, and continued to occupy one of the most prominent positions in the rank of locomotive manufacturers up to the time of their absorption by the combination.

The Brooks Locomotive Works, at Dunkirk, N. Y., was originally intended to serve exclusively as the locomotive building and repair shops of the Erie Railroad. In 1869, however, the railway company decided to abandon these shops. Newer works had already been constructed in a more convenient location for the railway company's purposes and Jay Gould, who was then president of the road, saw no reason why the Dunkirk plant should not be closed. At that time, however, Horatio G. Brooks was the superintendent of motive power and machinery construction for the Erie road. As his home was at Dunkirk, and as all his interests centered about that place, he realized that the removal of these works would prove a severe blow to the prosperity of the town. As the result, he offered to lease the shop and its machinery for the purpose of undertaking the establishment of an independent concern, and as Mr. Gould was nothing loath to make such a mutually advantageous agreement, the lease was signed in November. Before the close of the year 1869, two locomotives had been turned out, and from that time the works were extended until, in 1883, the entire plant, which then covered an area of more than 20 acres, was purchased from the New York, Lake Erie and Western Railroad Company by the Brooks Locomotive Works.

The Richmond Locomotive and Machine Company, of Richmond, Va., was the only locomotive manufacturing plant in the South. When it was established, in 1865, it was intended for the manufacture of plantation and saw-mill machinery, and it was not until many years later that it began to build street cars — horse cars at first, and, finally, motor cars. In 1889, the company secured a contract from the Government to build the machinery for the new battleship Texas, and, although this work was successfully completed, the concern has since devoted its attention almost exclusively to the making of locomotives.

The Dickson Manufacturing Company, of Scranton, Pa., was established in 1862, and, ever since that time, the concern has been successful manufacturers of locomotives and mining machinery operating two separate establishments in Scranton for these purposes. The locomotive works were acquired by the American Locomotive Company in 1901.

The Manchester Locomotive Works, of Manchester, N. H., have been prominently identified with the locomotive building industry since they were established, in 1854, by Aretas Blood, one of the pioneers in engine construction.

The works of H. K. Porter & Company were established by the firm of Smith & Porter, in 1866. Later the concern was known as Porter, Bell & Company. Although locomotive builders in the strict application of the term, their efforts have been devoted exclusively to such lines as light locomotives for use in mines, manufacturing establishments, and for all kinds of contractors' and construction work.

From the figures in relation to annual production which have already been given it is not difficult to estimate that the aggregate capacity of the locomotive manufacturing establishments of the country, not including the railroad shops and the shops not regularly engaged in this business, is in excess of 5,000 locomotives. Of course, the demand for such machines varies from time to time, being dependent upon two factors: (1) The general prosperity of the country, a condition upon which the volume of freight to be transported, which is the basis of railroad earnings, so largely depends, and (2) the mileage of new lines under construction, the completion of which means new equipment. In one sense of the word it may be held that these two factors are really one, new lines scarcely ever being built in those periods of financial stagnation when the people are hoarding their money and capitalists are too timid to venture to encroach upon their principal. As the result business prosperity in the locomotive-manufacturing industry is intermittent. As the average life of a locomotive is about 20 years, it requires an annual production of some 2,500 machines to supply the demand that is due to natural conditions, and as the locomotive shops of the country possess a capacity of about twice that number of engines, the difference between these 2,500 and the total production of all the American works, must find an outlet through one of these three channels: They must be used in the equipment of new lines; in the improvement and extension of old lines or they must be exported to other countries. The following table shows the total production from 1895 to 1910, as well as the number exported to other lands than Canada or Mexico.

LOCOMOTIVES PRODUCED AND NUMBER EXPORTED.

YEAR	Total Production Reported.	Number Exported Omitting Mexico and Canada.	Remainder not Exported.
1898	1,875	468	1,407
1899	2,473	517	1,956
1900	3,153	525	2,628
1901	3,284	423	2,961
1902	4,070	365	3,705
1903	5,152	289	4,863
1904	3,441	504	2,937
1905	5,491	583	4,908
1908	.....	531	.....
1909	.....	246	.....
1910	.....	199	.....
Average	2,961	422	2,550

According to the figures given in 'Poor's Manual,' the number of locomotives in use by the railroads of the United States, Canada, and Mexico, during these years, was as follows: 1895, 36,610; 1896, 36,388; 1897, 36,410; 1898, 36,746; 1899, 37,245; 1900, 38,065; 1905, 48,357; 1906, 51,672; 1907, 55,388; 1908, 57,698. In 1905, the establishments representing the locomotive-building industry employed an aggregate of 40,000 men, at a wage which amounted to fully $25,000,000 per annum. When operated to their full capacity the total value of the products in the United States would be more than $60,000,000.

Although the American builders of locomotives at first depended upon English models in their work, they were soon able to produce a machine that was capable of attracting attention abroad. The first locomotives exported from this country were sent to the Birmingham & Gloucester Railway in England by William Norris in 1840 and others were supplied to the Royal Wurtemberg Railroad by the Baldwins, in 1845. Three years later the Rogers were called upon to ship some of their locomotives to Cuba, and, since that time, these products of American industry and genius have been sent to almost every part of Continental Europe, even England, with its own resources for engine building having been among the foreign purchasers of our locomotives. Unfortunately, for the sake of the statistics, there are no figures that can tell authoritatively how many locomotives were exported by the United States builders during the early years of the industry, and, as even the later statistics are incomplete, in view of the fact that they do not cover the shipments to Canada and Mexico, it is very difficult to obtain anything like a comprehensive idea of the subject. According to the best figures obtainable, during the 26 years that elapsed between 1879 and 1904 inclusive, no less than 6,173 were sent to foreign countries from ports in the United States, while their value was placed at $57,843,005. We are also aware that, at the present time, American locomotives are not only in use in almost every part of the world but that they are constantly being shipped to almost every inhabited portion of the globe.

One excuse for England's remarkable interest in American locomotives may be found in the labor conditions that have existed from time to time in that country. Thus, in 1898, when the Midland, the Great Northern, and the Great Central railroads together ordered no less than 80 of our machines, 70 from the Baldwin works and 10 from the Schenectady works, they were somewhat compelled to resort to this method of relief. All through the year 1897 the engineering works of Great Britain had been affected by a strike, and, in 1898, when the men finally returned to their work, the several plants were so overcrowded with orders that it was impossible for them to meet all the demands that were made upon them. Naturally, when the American locomotives appeared they were subjected to all sorts of adverse criticism by the British builders. Efforts were made to show that they could not be compared to the English machines, either in point of speed, or in matter of economy, but as the statements made were all biased and inconclusive, the American manufacturers have not taken them greatly to heart, especially in view of the fact that they are constantly being called upon to furnish machines for use in various parts of Asia and Africa, where, coming into direct competition with the English product, the railroads have had an opportunity to test the truth of such charges.

In 1832, the Philadelphia, Germantown and Norristown Railroad Company paid Matthias W. Baldwin the sum of $4,000 for the locomotive, "Old Ironsides." From that time the price charged for such machines slowly but steadily increased until, during the period of the Civil War, sums ranging from $30,000 to $35,000 were received for the heavy freight or passenger locomotives. Of course, locomotive building was no exception to the other industries, and, after war times, the prices of its product declined to about $7,000 for a 35-ton passenger locomotive. This was the price that prevailed about 1879, and while, during 1880 and 1881, prices rose rapidly until fully $15,000 was paid for a similar machine, they declined gradually until 1896, for while it is true that from $8,000 to $9,000 was paid for an average passenger locomotive, and from $9,000 to $10,000 for an average freight locomotive at that time, the fact that there had been a constant reduction in the price per pound indicates conclusively that the actual price for the entire engine was due to the fact that the weight of the locomotives had continued to increase, to meet the greater demands of traffic conditions.

The introduction of the 50-ton steel car, in 1897, brought about a marked advance both in the weight and the power of the locomotives. To meet this new demand the weight of the ordinary consolidation freight locomotive, which had ranged from 60 to 70 tons, was increased to 80 to 100 tons, while some of the machines that were constructed were as heavy as 115 tons, exclusive of tender. As such an increase of weight and power had been inspired solely by business conditions, the railroads were quick to respond to such an evidence of prosperity by ordering the kind of rolling stock that was necessary to enable them to meet these new requirements and which would just as certainly increase their own earning power. In 1897 materials cost more than they do to-day, and, wages were higher. Taking these facts into consideration it is by no means surprising that the construction of such heavy locomotives should have brought the price to $15,000 or $16,000.

It was a similar demand for more powerful locomotives, for engines not only capable of hauling heavy trains at sustained high speed, but also of accelerating speed rapidly after starting, that brought the new and heavier types of passenger locomotive into existence. The old American, or eight-wheel type, was wholly incapable of meeting such requirements. The ten-wheel engine, which had hitherto been used quite successfully on heavy grades, proved unsatisfactory in such an emergency, owing to its comparatively small driving wheels, its inadequate firebox, an adhesion considerably in excess of the requirements, and excessive resistance within the machine itself. To overcome these difficulties the Baldwin Locomotive Works constructed the Atlantic type of engine. It was substantially a ten-wheel locomotive, in which the rear pair of driving wheels was replaced by a pair of trailing wheels of smaller diameter, permitting the introduction of a deep firebox with ample grate area and volume sufficient to admit of thorough combustion. Great boiler capacity was available in proportion to the adhesion; the driving wheels were closely coupled, and the total wheel base was sufficiently long to give smoothness of motion at high speed, and, at the same time, sufficient flexibility.

Fuel economy is one of the most important factors in the running of locomotives, and it was the railroad men of Europe who were first to experiment along such lines by the use of the compound locomotive. Among those who may be mentioned as leaders in the movement for the development of the compound locomotive were Lindner, Von Borries, La Page, Worsdell, and Webb. In the United States a two-cylinder or cross-compound locomotive had been designed by W. S. Hudson of the Rogers Locomotive Works as early as 1873. The engine was never constructed, however, and it was not until 1882, when the four-cylinder tandem compound locomotive designed and patented by Henry D. Dunbar was tested on the tracks of the Boston and Albany Railroad that such a machine was operated in this country. Even then, however, the matter was dropped for a time, and when, in 1889, the Pennsylvania Railroad imported one of the Webb compound locomotives the object was entirely an experimental one. It was during the same year (1889), that Samuel M. Vauclain, the superintendent of the Baldwin Locomotive Works, completed his design for a four-cylinder compound locomotive, in which the high-pressure and the low-pressure cylinders were placed one above the other on either side of the locomotive, both being formed within a single casting, together with the steam-chest, an arrangement which enabled them to occupy the same space as had formerly been devoted to the ordinary single-expansion cylinders. The two piston-rods were connected with a common cross-head, but, back of the cross-head pin, there was practically no change from the mechanism of the ordinary engine. A little later another two-cylinder or cross-compound locomotive was invented by A. J. Pitkin, the superintendent of the Schenectady Locomotive Works. This machine had a form of intercepting-valve differing from those which had hitherto been used, either here or abroad.

In 1902 the Baldwin Locomotive Works built their first balanced compound, to the designs of S. M. Vauclain. Since that time about 160 of these engines have been constructed. A few locomotives of somewhat similar design have been built by the American Locomotive Company to the designs of Mr. F. J. Cole. Altogether there have been built in the United States over 4,000 compound locomotives.

As has been stated, Peter Cooper's first model attained a speed of 18 miles per hour. According to statements that ought to be regarded as reliable Baldwin's «Old Ironsides» once attained a record speed of 60 miles an hour for a short distance, and other examples of the high speed had several times been shown by the old-time locomotives. In fact, the real progress in locomotive development in the United States had not been marked by an increased capacity for speed so much as by an increased hauling power. Instead of designing locomotives capable of breaking the speed record the American builders had been endeavoring to construct locomotives that would draw heavy trains at a steady rate of speed, and in this effort their success had been phenomenal. In fact, up to 1889, there had been no demand for an engine of greater speed than 50 miles an hour, and it was not until the compound system was introduced that locomotives were expected to exceed that limit. From that time, however, the matter of speed became a factor in the building of locomotives, and these are some of the results obtained by American-built engines:

In November, 1892, locomotive No. 385 — one of the Vauclain compounds — running on the Philadelphia and Reading and the Jersey Central railroads, between Philadelphia and Jersey City, with a train of four heavy cars attached, attained a speed equal to 97 miles per hour, by covering one mile in 37 seconds. On May 10, 1893, locomotive No. 999, on the New York Central Railroad, attained a speed equivalent to 112½ miles an hour, by hauling the Empire State Express, with its four heavy cars, a distance of one mile in 32 seconds. On July 19, 1893, locomotive No. 682, on the Philadelphia and Reading Railroad, accomplished the remarkable feat of hauling a train of nine heavily loaded passenger cars from Winslow Junction to Pleasantville, a distance of 26 miles, in 22 minutes, which was equivalent to the rate of 70.9 miles per hour. On August 27 the same locomotive succeeded in hauling 17 loaded passenger cars the same distance in 27 minutes, or at the rate of 57 miles per hour, a performance which was even more remarkable, considering the weight of the train attached.

On September 11, 1895, the Empire State Express, on the New York Central Railroad, with its four cars, ran from New York to East Buffalo, a distance of 436½ miles, in 407⅔ minutes, this being an average speed of 64.26 miles per hour. While these runs have been exceptional exhibitions of speed, since 1896, the Philadelphia and Reading Railroad has been operating, during the summer months, a service by which trains of five or six passenger cars have been hauled between Camden and Atlantic City, a distance of 55½ miles, in 48 minutes, and these runs have been made with great regularity. The locomotives used for this purpose have been of the Atlantic type, with Wootten boilers and 84-inch driving wheels.

On July 9, 1905, what is known as the Scott Special, on the Atchison, Topeka and Santa Fe Railway, left Los Angeles for a continuous trip to Chicago. The distance of 2,245 miles was covered in 43 hours and 55 minutes, making an average of 52 miles per hour for the entire distance, the highest speed officially recorded for a given distance being at the rate of 106.1 miles per hour.

Although the ancient records are somewhat vague in reference to the matter, it is generally believed that the first experimental steam engine ever built in the United States was constructed by Christopher Colles, a lecturer before the American Philosophical Society, at Philadelphia, in 1773. Beyond this fact even tradition is silent until we come to 1787, when John Fitch launched, on the Delaware River at Philadelphia, a steamboat, which, being propelled by paddles, was capable of attaining a speed of 13 miles per hour. In 1796 he experimented in New York waters with a boat operated by means of a screw. His experiments were closely followed by the more practicable ones of Robert Livingston, while Samuel Morey, Nathan Read, Nicholas Roosevelt, Oliver Evans, John Stevens, and of course, Robert Fulton were among the pioneer-mechanics who devoted their attention most closely to steam navigation.

The history of transatlantic steam navigation dates from the year 1819, when the American steamer «Savannah» made its first trip from Savannah to St. Petersburg, and the progress in ocean transportation, which has been almost too great to be calculable, has been due almost entirely to the development of the marine engine through its several forms of single, double, triple, and even quadruple expansion cylinders. It is a long step from the slow old "Savannah," with her crude mechanism, to the magnificent ocean palaces of our time, some of which have a speed ranging from 500 to 600 miles per day, but much of the credit for this development must always be given to such master minds of the early days as John and Robert Stevens, John Ericsson, the Copelands, Robert Thurston, and James P. Allair.

While there have been many improvements in the art of engine-building since 1850 they have applied to the details of construction rather than to any marked change in type. In American engine-building, at least, the efforts of the engineer have been to secure high efficiency with the greatest possible degree of economy. Thus the introduction of the invention known as the Corliss valve gear was hailed with delight by all who were interested in the development of engine building. This is a device by means of which steam is admitted into the cylinder for any desired portion of the stroke, while the point of cut-off, which is automatically maintained by the governor, does not in the least affect the free opening of the exhaust. Of course, this was not the first attempt that had been made to use the steam expansively. Many devices had been introduced before this time, and one of them was used quite generally throughout the country between 1841 and 1849, at which time George H. Corliss brought out his improvements upon the expansion gear. The older invention was the achievement of Frederick E. Sickles. It consisted merely of a drop cut-off with detachable valve gear.

The adoption of the surface condenser must also be regarded as one of the great improvements of practical utility in the economy of the style of engine to which it is adapted. From one end of the country to the other, however, there was an ever-increasing call for engines which, while they were smaller in size, would be capable of developing greater speed and higher steam pressure. As early as 1823, Jacob Perkins, one of the pioneer engine builders, began to experiment with high pressures, and, in 1827, he constructed a single acting engine in which steam of 800 pound pressure was used. A few months later he so far improved upon his previous results as to construct a compound on the Wolfe plan in which he was able to secure a pressure of 1,400 pounds, expanded eight times. So assured was he of the practicability of his discoveries that he was willing to propose to adopt a pressure of 2,000 pounds, using engines of small cylinder dimentions and cutting off the admission at one-sixteenth of the stroke. While these excessive pressures were not adopted at the time, the results of Jacob Perkins' experiments were of the greatest value in later years, when engine-builders were ready to consider the greater economy of high pressure steam, for as soon as the public realized that such power could be adopted their demand for engines in which such high pressures could be utilized to secure a high rate of speed compelled the builders to devise some means of meeting these requirements. A number of these designs were made and some of the engines were constructed. The most noted of these, the Westinghouse, is a double-cylinder, single-acting engine, and has come into very extensive use by reason of its low cost and simplicity as well as for its high degree of efficiency.

During the past few years the steam turbine has attracted a great deal of attention owing to its remarkable capacity, both for economy and for wide range of load. In the engines of the turbine type the steam is converted into power through the impact and reaction due to its velocity, which is materially increased by liberation and expansion. The advantages which it presents over the ordinary steam engine are to be found in its continuous rotative action; in the absence of dead centres and the mechanical complications that are consequent thereto, and in the absence of the strains suddenly applied and reversed which are absolutely unavoidable in a reciprocating engine. There are two turbine systems at present in use. One is the De Laval; the other is the Parsons.

The De Laval system is based on the principle of the axial jet turbine water wheel, the jets of steam being brought into contact with the blades of the turbine wheel, at the proper angle, and passing through to the discharge. To obtain the greatest effect it is necessary that the turbine should reach a high rate of velocity, which is sometimes as great as 30,000 revolutions a minute, but this excessive rate may be reduced to a more normal speed by a cleverly devised system of gearing.

The Parsons steam turbine, which is manufactured by the Westinghouse Company, differs in many respects from the De Laval system. For example, the main armature, or drum, may be run at a lower rate of speed with practically the same economical results. The cylindrical steam chamber, which has a varying internal diameter, is provided with numerous rows of curved guide plates, or vanes. Central drums, which show a corresponding varying diameter, and to which are secured several rows of blades, so arranged as to fit between the stationary vanes, form the rotating portion, and its shaft is so devised that it may be coupled direct to the armature of a dynamo, or may receive a pulley for belt drive. Thus the steam, which is introduced at the small end of the cylindrical chamber, is guided in its proper direction by the rows of stationary plates, passing from these vanes to the movable blades, by acting, first upon the smaller set of blades, from which it is expanded into the larger portion of the chamber to act upon the next larger set of blades, and so on, throughout the series. By this device, which increases the diameter of the rotating parts, the speed of the shaft is reduced and the necessity of back gearing is avoided.

Naturally the chief object of competition among engine builders during the past half century has been to reduce the cost of manufacture. In many instances this result has been attained by simplifying the methods of construction. Thus, one of the most important changes that has been made in recent times is the system adopted so generally by builders of merchantible engines in reducing the number of main parts to a single column or bed-plate, the revolving and reciprocating parts being supported, and the cylinder secured directly to this bed. To-day engines of this type — both horizontal and vertical — are made in all parts of this country. In fact, to fully comprehend the efficiency of the modern steam engine it is necessary to remember that prior to 1850 it required from five to eight pounds of coal, and fully as much as 80 pounds of water per horse-power per hour to operate the most economical engine that had then been placed upon the market. To-day, however, the same results may be obtained by an expenditure of but 1.8 pounds of coal and 15 pounds of water per horse power per hour.

Interesting as it would be to examine an array of statistics that would show the amount of capital involved, the number of men employed and the value of the annual production of all the branches of the engine-building industry, the manufacture of engines is so widely distributed among so many shops of such various kinds that it is impossible, either by reference to the census reports or by any other means, to give any figures that could be accepted as reliable. To-day there is scarcely a town of any importance in which there are not one or more shops where engines of one kind or another are built and it seems to be utterly impossible for statisticians to get such a diversified industry under anything like a comprehensive classification.

For example there are several important branches of the industry of engine building that have not even been mentioned, for the manufacturer of gas engines, which are now working in units of upward of 700 horse-power; the makers of steam road-rollers, and of motor vehicles, to say nothing of the manufacturers of steam fire-engines, all deserve to be included in the list of engine builders. It was in 1842 that Capt. John Ericsson built the first steam fire-engine. It was tested in the city of New York, but was not adopted for general use as the time required to raise the steam was then fully 18 minutes. In 1853, however, by which date the time in which steam could be raised had been reduced to less than four minutes, an engine of this character was adopted by the fire department of Cincinnati, and, from that day, the improvement in their mechanism has continued, and their use has become so general that even small villages are now protected by such machines.

No review of the engine-building industry would be complete without some reference to the use of electric power as a means of propulsion. Regarded as little more than an impracticable project a trifle more than 30 years ago, the substitution of electricity for other motive powers has now become so general that it is impossible for any one to predict just how far the movement will go. Already the tramway lines in every part of the world have adopted electricity. It has taken the place of steam in the operation of elevated railroads and subway systems, and has already encroached so far upon the provinces formerly sacred to the steam engine — being used for switching purposes, in the suburban railway service, and for many quick short runs — that nobody would be surprised at the announcement that some one of the great railway systems had determined to adopt such power for more general work. The progress of the electrical science has been so rapid that what was a novel invention yesterday is obsolete to-day, and it is impossible to imagine how much further its development will proceed.

As a matter of fact, however, these words apply almost as well to the progress of steam-engineering as they do to that of electricity. While the development in the use of steam has been so great that it has practically revolutionized our methods of living, there is no reason to believe that its progress is approaching its termination. Already the use of engines that have been made for torpedo boats and submarine craft, as well as the experiments of Maxim and Langley, and the introduction of steam engines and boilers of power hitherto inconceivable in view of their lightness, all tend to indicate that the art of steam-engineering is destined to still further development.

Alba B. Johnson,
Baldwin Locomotive Works.

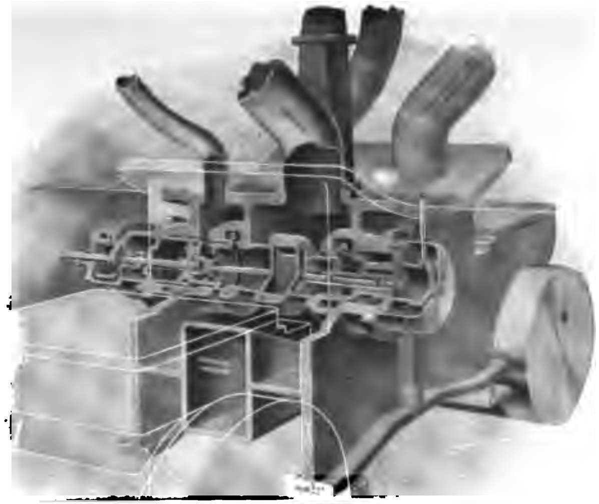
Locomotives, Compound. The compound locomotive, like the compound stationary engine, is designed to save fuel by requiring less steam to do a given amount of work. A compound locomotive is not necessarily any more powerful, nor any faster, than a simple engine, but will do the same work with less coal and for less money. A compound locomotive, however, may be both faster and more powerful than a simple engine for the reason that as the compound uses less steam (q.v.) doing the same work, the same boiler that supplies a simple engine will do more work with compound cylinders.

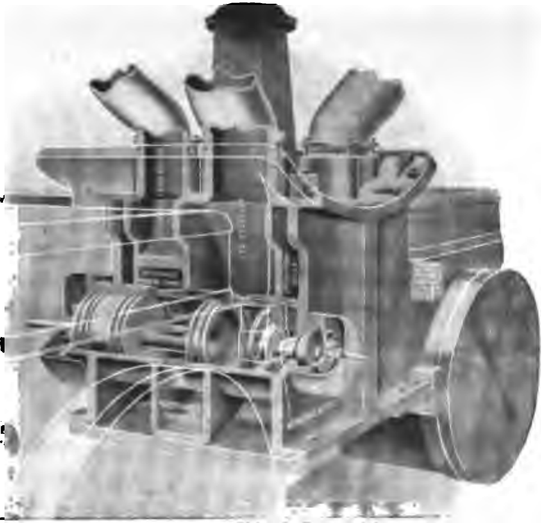
The principle of compounding steam cylinders is to let the exhaust from the high pressure cylinder go to the low pressure and drive that before escaping to the atmosphere. This is done to divide the expension between the two cylinders instead of doing it in one, the aim being to avoid excessive condensation. Steam at 200 pounds gauge pressure per square inch is at a temperature of 387 degrees, while the back pressure or pressure of the steam that is being pushed out of the cylinder by the returning piston will average about 5 pounds or 227 degrees. The steam then would expand from 200 down to 5 pounds or a difference of 160 degrees of heat. The cylinder cools down with the steam (though not so rapidly) and, presenting a comparatively cool surface to the next admission of steam, condenses a portion of it. The heat from the condensed steam goes to warm the walls of the cylinder which are again cooled by the expansion.

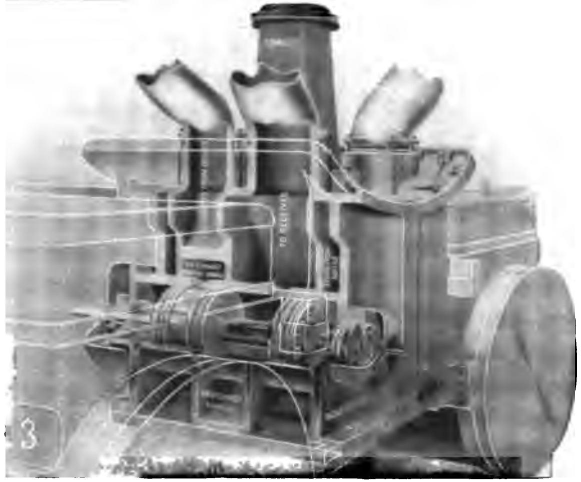
The ideal compound locomotive seems to be one that can be used either simple or compound at any time or for any length of time at the will of the engineer. When used in either condition it should be of equal power on each side, and when running simple should be as economical as any simple engine under the same conditions. It should of course only be used simple in starting or in getting a train over a bad part of the road. The engine should not be worked simple any more than necessary, as in the compound position it is saving the fuel. Nor should an engine working compound be hooked up to cut off as short as in working simple.

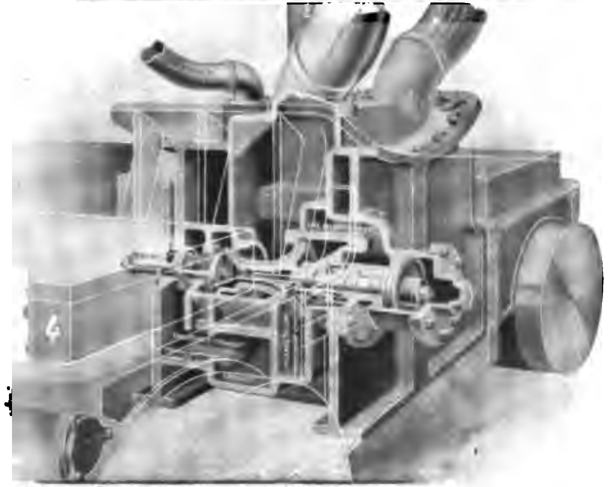
The first compound locomotive of which we have record is that of Thomas Craddock who began experimenting in April 1844. In his book, 'The Chemistry of the Steam Engine,' published in London in 1848, he proclaims the superiority of the compounding feature and de-

OPERATION OF LEADING COMPOUND LOCOMOTIVES



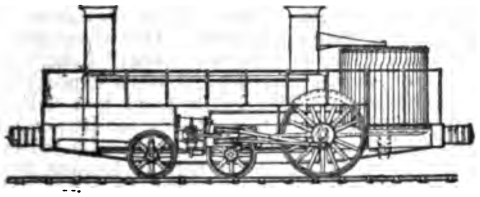






1. Schenectady Compound — **simple.**
2. Pittsburg Compound — **working simple.**
3. Pittsburg Compound — working compound.
4. **Richmond Compound — simple.**

scribes an engine in which «*one* eccentric, *one* valve, *one* crosshead, *one* connecting rod and *one* steam box serve both cylinders.» He evidently abandoned this, as in the engine shown


Compound Locomotive of Thomas Craddock. 1848.

he used two crossheads and two connecting rods, although he used but one valve. He also used a fan condenser as will be seen, and claimed a vacuum of 24 inches. The cylinders of this engine were 6 and 14 inches respectively, or a ratio of 1 to 5.4. Another plan of his was also shown, but there is no record of its having been built. He used 115 pounds of steam, but predicted the use of 200 pounds in the nearer future than it was realized. His patent was dated 3 Dec. 1846. Other early inventors were: John Nicholson, James Samuels and Frazer Selby, all English.

The first American compound locomotive was built at the Shepard Iron Works, in Buffalo, from the designs of Perry & Lay in 1867. A switching engine of the Erie Railroad had their tandem cylinders placed on it. This engine worked nicely and ran for several years, but coal economy was still a question of the future, and as it was ahead of its time, the idea was abandoned. The next compound was of the two-cylinder type and was built in 1870 by the Remington Arms Company, at Ilion, N. Y., from the design of William Baxter. This was used on a suburban road, the Worcester and Shrewsbury, and gave good service. It has an intercepting valve under control of the engineer, and could be run as a simple engine any length of time. On 11 March 1873, a patent was granted William S. Hudson, of the Rogers Locomotive Works, Paterson, N. J., for a superheater in smoke-box, so arranged as to reheat the steam passing from high pressure to low pressure cylinders of a two-cylinder compound. This is sometimes cited as the first two-cylinder compound, but in reality none were built, and it was preceded by others as we have seen. About this time the compound began to excite more interest both in England and on the Continent. Prominent among them were Anatole M. Mallet, Francis William Webb, August Von Borries and Robert Lindmer.

This brings us to the later American designs, with which we are most interested. On 25 June 1889 a patent was granted to Samuel M. Vauclain, of Philadelphia, for a four-cylinder type of engine. Cylinders were parallel and connected to one crosshead. One patent shows two piston valves, another shows but one, which is the style now used and known as either the «Vauclain» or «Baldwin» type. It is rather a curious matter of patent history that on 18 June 1889, one week earlier, Joseph Lewis, of South Evanston, Ill., obtained a patent for a similar engine, except that the one piston valve was rotated by gearing instead of being a reciprocating valve. This engine has never been in service, however.

On 10 Dec. 1889 Albert J. Pitkin obtained his patent on what is now known as the Schenectady compound. As first built it went into compound automatically and could not be run as a simple engine except at the start, but this has been modified so as to make it optional with the engineer. On 27 May 1890 Henry F. Colvin, of Philadelphia, obtained a patent on the application of an automatic reducing valve to admit live steam to low pressure cylinder just in proportion to ratio of cylinders, so as to keep the total power on each side equal. This engine was built by the Pittsburg Locomotive Works. The Pittsburg compound has the intercepting valve on the high pressure side and it is not moved to compound automatically, but is moved independent of pressure in the receiver. It can be run simple any length of time (as is now common with them all), but this and the Rhode Island were the first to have this feature, except the Baxter before mentioned. In starting, the high pressure cylinder receives steam as usual, and the steam for the low goes through the reducing valve into the receiver, a separate passage being provided for the high pressure. Moving the valve into compound position shuts the live steam from the receiver and closes the independent exhaust of the high pressure cylinder and turns it into the receiver to the low.

The late C. H. Batchellor patented what is known as the Rhode Island compound on 22 Sept. 1891. This was similar to the Pittsburg engine in some ways, but had the intercepting valve on the low pressure side and goes into the compound automatically by an accumulation of reserve pressure. The Richmond compound (Mellin System) has the intercepting valve on the low pressure side, and is moved automatically by the receiver pressure.

The Richmond engine was the first to use an overpass valve. With an engine running without steam or «drifting» as railroad men call it, the cylinders become air-pumps. The air forced out drafts the fire at a time when it is not needed, and on mountainous roads cuts quite a figure in coal consumption. While this is present in any engine, it is aggravated in the large cylinder of a compound, and is usually met by the use of a vacuum valve at each end of the cylinder. These admit air and do not overcome the needless draft on fire. It is often charged that two-cylinder compounds «nose» around on account of developing more power on one side than the other, but this would seem to be largely imagination. A simple engine is always working one-sided in so far as one side is at maximum while the other is a minimum power, and it is nothing out of the usual to bring an engine in with one side uncoupled, the other doing all the work. The fallacy of one-sided working when running simple on account of large cylinders is shown by the action of reducing valve and the fact that careful tests show a variation of less than 2 per cent with careful designing. This is no more than is apt to be found on any engine after having its cylinders bored larger than the other — being simply trued up. The fact that a compound engine has more power when working simple than in compound is generally taken as showing that the reducing valve does not act quickly and the large cylinder gets more than its proportion of steam. That this is not the case we learn that the safety valve in the receiver passage — set to blow at the determined receiver pressure—rarely or never pops. The actual reason is that the high pressure cylinder is relieved by its back pressure, which adds quite a little to the effective forward pressure.

The last few years has brought the tandem compound to the front after the lines of Perry and Lay in 1867. These are the Schenectady, the Colvin-Wightman and the Baldwin. They are very heavy and powerful engines and are capable of heavy work. They are necessarily heavy in front and some of them are very inconvenient to get at and repair. This, however, is more the fault of the designer than the type. The balanced engine, too, is coming to the front, with one set of cylinders driving the wheels from the outside and the other by cranked axles on the inside. They are a development of the old Shaw and Strong locomotives. In France this is known as the DeGlehn type.

The points to be considered by the mechanical engineer, as in any case, are the construction from a mechanical point of view, the number of parts, their strength or delicacy, and the likelihood of failure. Also the number of ground joints, if any, and the result if they are not kept tight. As it is a simple case of dollars and cents, the additional first cost and cost of repairs as compared with a simple engine must be weighed against the fuel economy. If the net results were not satisfactory, the compound would not be increasing in use as rapidly as it is at present. That the compound locomotive has come to stay and is doing good work there is no doubt, in spite of the opposition in some quarters, and a fuel saving of from 10 to 30 per cent is being obtained in nearly every instance. Neither is the cost of repairs necessarily high. For a more detailed history of the compound locomotive, consult the Reports of the Franklin Institute on the subject.

Fred H. Colvin, M. E.,
Author of ‹American Compound Locomotives.›

Locomotor Ataxia, a disease of the nervous system, usually occuring in adults from 40 to 50, and characterized by pain, inability to walk, and by progressive weakness which leads finally to death. The malady is long drawn out, and while not entailing, as a rule, a great amount of physical pain, causes extreme inconvenience to the patient. In the vast majority of patients it first shows itself by neuralgic pains of the lower extremities. Thus, there may be acute darting and lightning-like pains, lasting from half an hour to an hour or two, about the ankles, in the instep, shooting up the leg, or in the thighs. Occasionally these pains are present in the arms and trunk. They are frequently diagnosed as neuralgia, and it is not until development of the symptoms of ataxia (q.v.)—inability to walk in the dark, and to place the foot or hand where the mind wishes it to be placed—that the true nature of the constant neuralgic pains is recognized. With the gradual development of the inability to walk there may be a number of other symptoms—acute, lightning-like pains in the stomach, intense, sometimes acute, pain in the bladder, sometimes loss of voice, etc. There may be patches of anæsthesia over the body and there is usually progressive muscular weakness. Loss of knee-jerks is an important early sign.

Associated with ataxia of the legs, which prevents the patient from walking readily in the dark, or up and down stairs, there may be some ataxia in the hands, whereby the finer movements of buttoning the clothing, of writing, etc., may be interfered with. A very constant and usually a very early sign of locomotor ataxia consists in certain changes in the reactions of the pupil of the eye to light. This symptom is technically known as the Argyll-Robertson pupil, and shows a fixed pupil when exposed to the influence of light, but a pupil that dilates or contracts normally when tested for its powers of accommodation. Thus the pupils of a patient who has this symptom contract on looking at a near object and dilate on looking at a far object; but if a candle or beam of light is thrown suddenly on the eye, normal quick contraction of the pupil is diminished or absent. The Argyll-Robertson pupil is sometimes found as early as the neuralgias, and a diagnosis may often be made on that alone.

The progress of the disease is usually very slow; remissions occur, which give great hope to the patient and afford ample opportunities for all forms of charlatanism; but the final outcome is usually hopeless. Many conditions of the spinal cord are known in which some of the symptoms of locomotor ataxia are present, chronic neuritis from alcoholism being one. As many of these are recoverable, the diagnosis of locomotor ataxia is an extremely difficult one, and can be made only by the competent specialist. Consult: Starr, ‹Organic Nervous Diseases› (1903); Marie, ‹Maladies de la Moelle.›

Lo'cris, the parts of ancient Greece inhabited and named after the Locrians, the oldest Grecian peoples. There were four branches—the Epicnemidian, the Opuntian, Ozolian, and Epizephyrian Locrians, the last a colony from the Ozolian stock, living in Lower Italy. Their capital, Locri, was one of the most powerful, splendid, and wealthy cities of Magna Græcia.

Lo'cus, in mathematics, when the conditions of a problem are not sufficient to determine the absolute position of a point, but restrict it to a certain line (or lines), this line is called the locus of the point. Thus, if the base and area of a triangle are given, the locus of the vertex is a straight line parallel to the base; or if the distance of a point from another point is in a given ratio to its distance from a given fixed line, the locus of the point is a conic section.

Lo'cust. See Grasshoppers; Cicada.

Locust Trees, a genus (*Robinia*) of leguminous trees and shrubs. The species have odd-pinnate leaves; pea-like flowers in drooping racemes; and pods containing several bean-like seeds. They are all useful for ornamental planting, and one species, *R. pseudacacia,* is highly valued for its timber. This species, which is the best known, and is also called false acacia and black locust, is the largest of its genus, attaining heights exceeding 75 feet and girths greater than eight feet in the rich alluvial soils of Tennessee and Kentucky. Its hard, tough, close-grained yellow wood is especially useful for ship-building, fence-posts, and other purposes in which great durability is required. It is also employed for making cog-wheels, tree-nails, for the interior finish of houses, for furniture and other uses where a highly polished wood is needed. It is the favorite material for policemen's clubs, not only because of its weight and toughness, when well seasoned, but because of its unusual resonance, giving a ringing report when struck upon the pavement as a signal which can be obtained from no other wood. In various parts of Europe great attention has been paid to the propagation of this tree, for ornament as well as for its useful properties, and its cultivation is further encouraged by the absence of the destroying insect above mentioned. It forms a pleasing object along the borders of many of the railways on the Continent, its spines adding to its usefulness as a hedge. When in bloom, the large pendulous racemes of fragrant white flowers, contrasting with the light-green foliage, produce a fine effect, and give this tree a rank among the most ornamental. The leaves are pinnate, and the leaflets very thin and smooth. The flowers, resembling in form those of the pea, diffuse a delicious perfume, and are succeeded by a flat pod.

The chief objection to the tree is its liability to the attacks of insects, more than 40 species being known to feed upon its leaves and wood. The foliage destroyers, which include leaf-rollers, leaf-miners, and several species that feed in exposed positions, are sometimes seriously destructive, the larvæ of one species, a saw-fly (*Nematis similaris*), sometimes destroying all the green parts. But they are less destructive than the borers which tunnel through and weaken the wood. Sometimes they are so numerous that the trees become mere shells of bark with a honeycomb of wood. The more important of these are the locust borer (*Cyllene robiniæ*), a black and yellow striped, long horned beetle in the adult stage, which is common in the eastern United States; and the larvæ of a moth (*Sciapteron robiniæ*), troublesome in the Pacific Coast region. These and some others have discouraged the commercial planting of this valuable tree.

Another American «locust» tree is found in the two species of the genus *Gleditsia* of the senna family, which includes the Kentucky coffee tree. These are the water or swamp locust (*G. aquatica*) of Florida, which has enormous spines and reddish flat oval pods; and the well-known and widely planted honey locust or honey shucks (*G. triacanthos*). This large graceful but exceedingly thorny tree bears especially fragrant flowers, and its pods are gathered by country people in the South and eaten for the sake of the sweet pulp between the seeds. Its great pods measure 10 to 20 inches long; are curved, and «in drying twist and retwist while they open, and skilfully scatter seeds in diverse directions.»

Lod'don, Australia, one of the most important rivers of Victoria; rising on the northern slopes of the Dividing Range, in Talbot County, flowing northwest for 250 miles, and joining the Murray at Swan Hill. It drains a basin of 4,800 miles and is subject to floods. Good cod and bream abound in it.

Lode, a metalliferous deposit, usually having the character of an ore-producing vein — confined within walls and having something of regularity. The name is sometimes applied to any regular course or vein, metallic or otherwise.

Lodeman, lō'dē-man, **Ernest Gustavus,** American horticulturist: b. Neuchâtel, Switzerland, 1867; d. 1896. He was graduated from the Michigan Agricultural College in 1889, in 1890 was appointed assistant to Professor Liberty H. Bailey of Cornell, and somewhat later an instructor in the university. He was the originator of the «spray-calendar,» a tabulated form furnishing the dates for spraying the fungi and insect pests of given crops and receipts for the preparation of suitable compounds for such use. His only publication is 'The Spraying of Plants' (1896), a valuable manual.

Lode'star, Loadstar, Polaris, or **Guiding Star,** various names given to the polar star which is the last star in the tail of the Little Bear. It is a star of the second magnitude, located 1° 20′ from the North Pole.

Lodge, George Cabot, American poet: b. Boston 10 Oct. 1873; d. 22 Aug. 1909. He was a son of H. C. Lodge (q.v.) and was graduated from Harvard in 1895. During the Spanish-American War he served in the American navy as ensign. He published 'Song of the Wave' (1898); 'Poems' (1902).

Lodge, Gonzales, American classical scholar: b. Fort Littleton, Pa., 19 Dec. 1863. He was graduated from Johns Hopkins University in 1883, was professor of Greek in Davidson College, N. C., 1886–8, and at Bryn Mawr College, 1889–1900. Since 1900 he has been professor of Greek and Latin at the Teachers' College of Columbia. He has published 'Lexicon Plautinum' (1901), and with Gildersleeve, 'Gildersleeve-Lodge Latin Grammar and Latin Composition.' He has edited 'The Gorgias of Plato' (1890), and the 'Gildersleeve-Lodge Latin Series.'

Lodge, Henry Cabot, American politician and author: b. Boston 12 May 1850. He was graduated from Harvard in 1871 and from the law school in 1875, being admitted to the bar in 1876. In 1873–6 he was editor of the 'North American Review'; was then lecturer on history at Harvard till 1879, when he became editor of the 'International Review' till 1881. Becoming active in political life he served two terms in the Massachusetts legislature; was elected to Congress in 1886, and served till 1893, when he was elected to the Senate; was re-elected in 1899, 1905, 1911. He was delegate-at-large to Republican National Conventions in 1884 and 1896, and permanent chairman of the 1900 convention. He has strongly advocated protection, and the restriction of immigration and the protection of the franchise by educational qualifications; he was a strong supporter of the policy of the administration during the Spanish War, and in regard to the Philippines, and was made chairman of the Senate committee on the Philippines, and a member of the committee on foreign relations. He has published 'Life and Letters of George Cabot' (1877); 'Short History of the English Colonies in America' (1881); 'Alexander Hamilton' (1882); 'Daniel Webster' (1883), and 'George Washington' (1889), in the 'American Statesmen' series; 'Studies in History' (1884); 'Boston' (1891, in the 'Historic Towns' series); 'Hero Tales from American History' (with Theodore Roosevelt, 1895); 'Certain Accepted Heroes' (1897); 'Story of the American Revolution' (1898); 'The War with Spain' (1899); and a volume of 'Speeches'; he has also edited the works of Alexander Hamilton (1885).

Lodge, Sir Oliver Joseph, English physicist: b. near Stoke-upon Trent, Staffordshire, 12 June 1851. He was educated at University College, London, and was demonstrator of physics there in 1875, and in 1877 professor. He was professor of physics in University College, Liverpool, 1881–1900, and since the date last named has been principal of the University of Birmingham. He has published 'Elementary Mechanics' (1877); 'Modern Views of Electricity' (1889); 'Pioneers of Science'; 'Signalling Without Wires'; 'Lightning Conductors and Lightning Guards.'

Lodge, Thomas, English dramatist and poet: b. West Ham, near London, England, about 1556; d. London September 1625. He entered at Lincoln's Inn, but seems to have led a wild and rollicking life, and in 1589–91 varied his life by taking part in two sea expeditions against the Spaniards, in the neighborhood of the Azores and Canary Islands. On the earlier of these he wrote the famous pastoral 'Rosalynde: Euphyes's Golden Legacie' (1590), which supplied Shakespeare with the basis of 'As You Like It.' Lodge himself wrote two dramas, 'The Wounds of Civil War' (1594; reprinted in Hazlitt's Dodsley's 'Select Collection of Old Plays,' Vol. VII.), and 'A Looking-glass for London and England' (1594), in collaboration with Robert Greene. Consult Jusserand, 'The English Novel in the Time of Shakespeare' (1890).

Lodi, lō'dē, Italy, a town in the province of Milan, Lombardy, on the Adda, 18 miles southeast of Milan. The principal buildings are the duomo or cathedral, a Gothic structure of the 12th century; the octagonal church of the Incoronata; the town-house; the episcopal palace; the Barni and Merlini palaces. Majolica and delftware, refined wax, saltpeter, and chemical products are manufactured. Stracchino and Parmesan cheese, which, though it takes its name from Parma, from which it was first exported, is almost wholly made in the district around Lodi, utilizing the milk of several thousand cows. The chief incident in Lodi's history is the entry by Napoleon after the famous passage of the Bridge of Lodi effected against the Austrians in 1796.

Lodomeria, lō-dō-mē'rĭ-ạ, Austria-Hungary, a former independent principality in Volhynia, since the division of Poland in 1772 constituting an integral part of Galicia (q.v.).

Lodz, lōdz, Russian Poland, the capital of a district in the government of Piotrkow, 76 miles southwest of Warsaw, and an important manufacturing centre, the terminus of a branch line from the Warsaw & Vienna Railway. It has made considerable modern progress owing to the flourishing condition of its cotton, woolen, and other manufactures. Silk goods are also manufactured, and there are dyeworks, breweries, machine-works, etc. The Roman Catholic Poles number about 40 per cent, German Protestants 33 per cent, and Jews 27 per cent of the population, which from 50,000 in 1872 had increased in 1910 to 500,000.

Loeb, lĕb, **Jacques,** German-American physiological chemist and biologist: b. Germany 7 April 1859. He studied at Berlin, Munich, and Strasburg, was assistant at both Würzburg (1886–8) and Strasburg (1888–90), studied at the Naples zoological station, and in 1891–2 was associate professor of biology at Bryn Mawr College. In 1892 he became assistant professor of physiology and experimental biology at the University of Chicago, and in 1895 associate professor. He was also professor of physiology at the Rush Medical College of Chicago from 1900. In 1902 he was appointed professor of physiology in the University of California. His chief work has been in physiological chemistry. He is the first to make researches in regard to tropic and chemical reactions in animal life. His experiments have shown that many activities of the animal world previously ascribed to ganglia and brain-centres are really due to such reactions. Thus he found that a certain chemical solution effects the contraction of muscular tissue known as "heart-beats," as tested on detached heart-tissue and hearts of certain animals and by introduction of the solution into human blood-vessels. He also made experiments in artificial partheno-genesis. He has published numerous essays, largely in the 'American Journal of Physiology,' and a volume 'Comparative Physiology of the Brain and Comparative Psychology' (1900).

Loeb, Louis, American artist: b. Cleveland, Ohio, 1860. He completed his studies in art under Gérôme in Paris, winning honorable mention at the Salon in 1895, and a 3d medal in 1897. As artist, illustrator, and teacher he has secured a notable place. His studio is in New York. As an illustrator of books and magazines he has shown both strength and inventive ability. In 1903 his exhibition of oils at the new rooms of the Co-operative Society in New York aroused interest in his later work, which shows a steady progress in his artistic achievements.

Loess, lĕs or lō'es, a loamy deposit of Pleistocene age, abundantly developed in the valleys of the Rhine, the Danube, the Rhone, and many of their tributaries. It is a pulverulent yellowish-gray or brownish loam, homogeneous and non-plastic, and consists principally of clay with small angular grains of quartz, and extremely minute scales of mica, together with a larger or smaller admixture of carbonate of lime and some iron oxide. It has a tendency to cleave in vertical planes, and thus forms cliffs where streams intersect it. The organic remains of the loess consist principally of land-shells of existing species, but now and again fresh-water shells are met with. Occasionally, also, the remains of man and the Pleistocene mammals are encountered. The deposit varies from a small thickness up to nearly 300 feet, and occurs at greatly differing levels, so that more than one agency would seem to have been active in its formation. Escaping flood-waters from glaciers are believed to have made much of the deposit; some of it may have been the result of weathering and rain-washings. The European loess is undoubtedly associated with the glacial deposits of the Continent, and in North America, where it is strongly developed, being very thick, as it is in parts of China (q.v.), the same relationship obtains. The geologists of the United States Geological Survey maintain that the accumulations which cover enormous areas in the great basin traversed by the Mississippi and its affluents are essentially fluviatile. Richthofen believes the Chinese accumulation to have been of æolian origin, and this theory of wind-blown material has also been advanced with respect to deposits in the United States; but the general opinion of geologists favors the theory of aqueous origin for the whole formation. Consult: Sixth Annual Report of the United States Geological Survey (1888); Chamberlin and Salisbury, 'The Driftless Area of the Upper Mississippi Valley'; McGee, 'The Pleistocene History of Northeastern Iowa,' in the United States Geological Survey, Eleventh Annual Report (1891); Geikie, 'Prehistoric Europe' (1881).

Loewe, Wilhelm (also called LOEWE-KALBE), German politician: b. Olvenstedt, near Magdeburg 1814; d. 1886. He was educated at Halle, and adopted the medical profession. Elected in 1848 to the Frankfort Parliament, he acted with the extreme party of democracy; became first vice-president of the Parliament; and later, at Stuttgart, was its president. Charged with sedition in this, which was considered a revolutionary procedure, and once acquitted, he was nevertheless sentenced to life imprisonment for contumacy. After some years in Switzerland, France, and England, he came to this country, and for eight years practised medicine in New York. Availing himself of the amnesty in 1861, he returned to Germany, and in 1863 was elected to the Prussian House of Deputies. Four years later he was a Progressist member of the North German Reichstag. Disagreeing with his party in 1874, on the military law, he attempted to form a new Liberal party. In the elections of 1881 he lost his seat.

Loewenthal, lē'vĕn-tăl, **Henry**, American journalist: b. New York 15 May 1853. Trained in the public schools and the College of New York, he studied law at the Columbia College Law School, taking his degree in 1875. He began newspaper work on the New York *Tribune* as reporter in 1872. In 1875 he was appointed law reporter on the New York *Times* and acting city editor in 1878. In 1879 to 1893 he was city editor, from 1873–96 had charge of real estate matters; was managing editor, 1896–1904 and since 1904 manager of the Los Angeles *Examiner.*

Loewy, lė-vē', **Maurice**, French astronomer: b. Vienna 1833; d. Paris 16 Oct. 1907. He was given a position in the observatory at Paris by Leverrier, and after the latter's death assisted Mouchez in the observatory of Montsouris. He was noted for his invention of the *Equatorial-coude,* or Elbow-equatorial, in which the observer remains seated at the upper end of the polar axis of the telescope, as if working with a microscope on a table, with the means of directing his view to any part of the heavens under his control. He also devised improved methods of determining the constants of astronomical refraction and aberration.

Lofoten, lō-fō'ten, or **Lofodden**, Norway, a group of islands off the northwest coast, stretching southwest to northeast about 175 miles. The largest are Andoen, Langoen, Hindoen, East and West Vaagen, and Flagstadöe. They have bold, precipitous, rugged, and deeply indented coasts, and an elevated, sterile interior, several containing mountains which, though not lofty, are covered with perpetual snow. Immense shoals of cod and herring frequent their shores, and extensive and valuable fisheries are carried on. The principal cod-fishery beginning January-February, ends in April, but the herring-fishery continues, and furnishes an important branch of national revenue. In ordinary years about 4,000 boats, each manned by five hands, are employed. The celebrated whirlpool, the Maelstrom, is situated at the southern extremity of these islands. Permanent population of group, about 20,000.

Lof'tie, William John, Irish Anglican clergyman, writer on antiquities: b. Tandragee, County Armagh, 25 July 1839. He was educated at Trinity College, Dublin, and after holding temporary Church appointments, became assistant minister of the Chapel Royal, Savoy, in 1871. He joined the staff of the 'Saturday Review,' and in 1894 that of the 'National Observer.' As a writer on antiquarian subjects he successfully combines learning and picturesque statement. He has published, 'Round About London' (1877; 4th ed. 1880); 'Plea for Art in the House' (1877); 'Memorials of the Savoy' (1879); 'A Ride in Egypt' (1879); 'A History of London' (1883); 'Authorized Guide to the Tower of London' (1886); 'London' (1887); 'Windsor' (1887); 'Westminster Abbey' (1890); 'The Cathedral Churches of England' (1892); 'Inigo Jones and Wren' (1893); 'Inns of Court and Chancery' (1894); 'London Afternoons' (1901); etc.

Lof'tus, Augustus William Frederick Spencer, English diplomatist: b. 4 Oct. 1817; d. 9 March 1904. He entered the diplomatic service in 1837 as attaché at Berlin and was likewise attaché at Stuttgart in 1844. He was secretary to Stratford Canning in 1848, and after serving as secretary of legation at Stuttgart (1852), and Berlin (1853), was envoy at Vienna (1858), Berlin (1860) and Munich (1862); became ambassador at Berlin 1865, to the North German Confederation 1868–71, and to Saint Petersburg 1871–9. He was governor of New South Wales 1879–85. He published 'The Diplomatic Reminiscences of Lord Augustus Loftus' (1892–4).

Log, an apparatus used to measure the rate of a ship's velocity through the water. For this purpose there are several inventions, but the one most generally used is the following, called the common log. It is a piece of thin board, forming the quadrant of a circle of about 6 inches radius, and balanced by a small plate of lead, nailed on the circular part, so as to swim perpendicularly in the water, with the greater part immersed. The log-line is fastened to the log by means of two legs, one of which is knotted, through a hole at one corner, while the other is attached to a pin fixed in a hole at the other corner, so as to draw out when sufficient force is exerted on it. The log-line, being divided by means of knots of colored cloth into certain lengths, which are in proportion to an equal number of geographical miles, as a half or quarter minute is to an hour of time, is wound about a reel. The whole is employed to measure the ship's head-way in the following manner: — The reel being held by one man, and the half-minute glass by another, the mate of the watch fixes the pin and throws the log over the stern, which, swimming perpendicularly, feels an immediate resistance, and is considered as fixed, the line being slackened over the stern to prevent the pin coming out. The knots are measured from a mark on the line at the distance of 12 or 15 fathoms from the log. The part of the line between the log and this mark is called the stray-line. The glass is turned at the instant that the mark passes over the stern, and as soon as the sand in the glass is run out the line is stopped. The water then pressing on the log dislodges the pin, so that the board, now presenting only its edge to the water, is easily drawn aboard. The number of knots and fathoms which had run off at the expiration of the glass determines the ship's velocity.

Log-book, a book in which are officially recorded the proceedings on board a ship. In it the contents of the log-board are daily transscribed at noon, together with every circumstance deserving notice that may happen to the ship or within her cognizance, either at sea or in a harbor, etc. In addition to the weather, speed, astronomical observations, etc., the entries required to be made include convictions, offenses, punishments, conduct of crew, illnesses and injuries, deaths, births, and marriages, quitting the ship, wages of men entering the navy, wages of deceased seamen, sale of deceased seamen's effects, collisions — in short, every condition, occurrence, and transaction which comes under official notice. The log-book must be signed by master and mate, and certain other persons in particular cases.

Log Cabin and Hard Cider, a term used in American politics in the campaign of 1840. The Whig candidate for President, William Henry Harrison, was a military man of plain manners. One of the Democratic papers, scoffing at the Whigs for taking a candidate not of the first caliber, advised that Harrison be given a log cabin and a barrel of hard cider, and he would stay contentedly in Ohio. This was taken up by the Whigs, and really helped to make their candidate popular with the masses. Log cabins were erected in great numbers in the cities, and were carried in processions, accompanied with barrels of cider.

Log-rolling, in American politics, a term used for maneuvers of politicians, by which they seek to secure co-operation in carrying favorite measures through legislatures and other bodies. Generally log-rolling is employed by individuals who approach others in support of personal schemes and interests. The word was formerly very popular in the United States, but has become almost obsolete, being supplanted by the term «button-holing.»

Logaœdic (lŏg-ạ-ē'dĭk) **Verse,** in Greek and Latin poetry, a rhythm in 3/8 time; now obsolete and are rarely found except in imitations of classic lyric measures. See Metre; Rhyme.

Logan, lō'gan, English name of the American Indian chief Tah-gah-jute: b. about 1725; d. 1780. He was the son of Shikellamy, a celebrated chief of the Cayugas, who lived at Shamokin on the Susquehanna, and was called Logan from James Logan, the secretary of Pennsylvania and a firm friend of the Indians. In his early manhood he was known throughout the frontier of Virginia and Pennsylvania for his fine personal appearance, engaging qualities, and his friendship for the whites. About 1770 he removed with his family to the banks of the Ohio, where he gave way in a measure to intemperance. In the spring of 1774 his family were massacred, it was alleged, by a party of whites led by Captain Cresap, under the pretext of retaliation for Indian murders; but it is exceedingly doubtful whether Cresap had any connection with the transaction. Logan at once instigated a war against the scattered settlers of the far West, and for several months fearful barbarities were perpetrated upon men, women, and children. He disdained to appear among the chiefs who subsequently sued for peace, but sent by an interpreter to Lord Dunmore, the governor of Virginia, the noted speech explaining his conduct, which was first published in Jefferson's ‹Notes on Virginia.› Its authenticity is open to much doubt, however. While intoxicated he attacked a party of friendly Indians and was killed by his relative Tod-hah-dohs in self-defense.

Logan, Benjamin, American pioneer: b. Augusta County, Va., about 1752; d. Shelby County, Ky., 11 Dec. 1802. He early crossed the Alleghanies and became a settler in Kentucky. He was an associate of Simon Kenton and Daniel Boone in the Indian fighting then constantly in progress on the frontier. During the Revolutionary War he was also active in the contests between the colonial frontiersmen and the British and their Indian allies. In 1776 he built one mile east of Stanford, Ky., on the site now called St. Asaph's Spring, the stockade known as «Logan's fort.» When this fort had for weeks in 1777 been besieged by Indians, Logan made his way through the enemy's lines and traveled 150 miles to Holston where he obtained supplies and reinforcements. He participated as second in command in Colonel John Bowman's expedition against the Shawnees at Chillicothe, and led the force sent against the Indians under Simon Girty. His advance guard, through over-haste, was defeated at Blue Licks, and Logan himself did not reach the scene of battle until the succeeding day. In 1788 he commanded a force of 600 against the northwestern Indians. He was for many years a member of the Kentucky legislature; and sat also in the State constitutional conventions of 1792 and 1799. His prowess was celebrated on the frontier.

Logan, Celia. See Connelly, Celia Logan

Logan, Cornelius Ambrosius, American dramatist: b. Baltimore, Md., 1806; d. near Wheeling, W. Va., 1853. After a varied career as actor and manager he became a theatrical manager in Cincinnati in 1840. He made a vigorous reply to Lyman Beecher's attack upon the stage from the pulpit; and wrote several successful plays, such as: ‹Yankee Land› (1834); ‹The Way of Maine›; ‹A Hundred Years Hence›; a burlesque; ‹The Wood Dealer.› He also wrote tales and poems.

Logan, George, American statesman and philanthropist; grandson of James Logan (q.v.), b. Stenton, near Philadelphia, 9 Sept. 1753; d. there, 9 April 1821. He was educated in England, subsequently studied medicine in Edinburgh, where he took the degree of M.D., and afterward returned in 1779 to America. For many years he devoted himself to agricultural pursuits, which he was one of the first in America to prosecute successfully in a scientific manner. He also served several terms in the Pennsylvania legislature. At the outbreak of the French Revolution he embraced with enthusiasm its democratic doctrines, and joined Jefferson and the republican party in opposition to the federalists. In 1798, the United States being then on the brink of a rupture with the French republic, he departed for France, under the idea that he might contribute to the preservation of peace. He was well received by Talleyrand and Merlin, then chief of the Directory, and returned to America with the assurance of the desire of the French government to renew amicable relations with the United States. But as he had taken with him letters of introduction from Jefferson instead of passports from the state department, he was denounced by the Federalists on his return as the treasonable envoy of a faction who had undertaken to institute a correspondence with a foreign and hostile power. He was coldly received by Washington and President Adams, and in the latter part of 1798 an act, known as the "Logan act," was passed by congress, making it a high misdemeanor for a private citizen to interfere in a controversy between the United States and a foreign country as he had done. He was subsequently elected to the United States senate, of which body he remained a member 1801-7; and in 1810, urged by the same philanthropic motives which had induced him to visit France 12 years before, he went to England in the hope of preserving peace. In 1797 he published 'Experiments on Gypsum' and 'Rotation of Crops.'

Logan, James, American colonial statesman and author: b. Lurgan, Ireland, 20 Oct. 1674; d. Stenton, near Philadelphia, Pa., 31 Oct. 1751. By his own efforts he acquired a knowledge of the chief ancient and modern languages, and in 1699, being then established in trade in Bristol, England, accepted an invitation from William Penn to accompany him to America in the capacity of secretary. In 1701, upon the return of Penn to England, he was appointed provincial secretary, and subsequently filled the offices of commissioner of property, chief justice, and president of the council, discharging in the last capacity the duties of governor of the province for two years after the demise of Governor Gordon in 1736. The latter years of his life were passed at his country-seat called Stenton, in the pursuit of literature and science. His chief work, 'Experimenta et Meletemata de Plantarum Generatione' (Leyden, 1739; London, translated from the Latin by Fothergill, 1747), an expansion of a paper on the growth of maize published in the 'Philosophical Transactions' for 1735, was considered an important contribution to the science of botany. He was the author of two other Latin treatises of a scientific character published in Holland, of an English translation of Cicero's 'De Senectute,' published in 1744 by Benjamin Franklin, and of Cato's 'Distichs,' the latter in verse; and he left a variety of papers on ethics and philology. The translation of Cicero was the first original one of a classical author printed in America. His library, numbering about 2,000 volumes, was, in conformity with his desire, presented to the city of Philadelphia, and is deposited in a separate department of the Philadelphia library under the name of the Loganian library. He was a member of the Society of Friends.

Logan, John, Scottish poet and Presbyterian clergyman: b. Soutra, Midlothian, Scotland, 1748; d. London, 28 Dec. 1788. In 1773 he was licensed as a preacher, and from his eloquence and fervor in the pulpit soon became popular. In 1786, however, owing to intemperate habits and kindred reasons, he was constrained to leave the ministry and going to London there engaged in literary work. His name is now best known in connection with that of Michael Bruce and the controverted authorship of the 'Ode to the Cuckoo.' That Logan is entitled to a place among the minor poets of Scotland is sufficiently attested by his exquisite lyric, 'The Braes of Yarrow.'

Logan, John Alexander, American soldier and politician: b. Jackson County, Ill., 9 Feb. 1826; d. Washington, D. C., 26 Dec. 1886. He studied at Shiloh College, volunteered as a private in the Mexican War, became a lieutenant in the First Illinois infantry, after the war studied law, was graduated from Louisville University in 1851, was admitted to the bar, and was elected to the Illinois legislature in 1852 and 1856. In 1858 he was elected a representative in Congress as a Douglas Democrat, in 1860 was re-elected, but resigned his seat in 1861, and on 13 Sept. was appointed colonel of the 31st Illinois infantry. He led this regiment in the attacks on Fort Henry and Fort Donelson, and was wounded at the latter. On 5 March 1862, he was made a brigadier-general of volunteers, and after commanding the 3d division of McPherson's corps (the 17th) in the northern Mississippi campaign, became major-general on 26 Nov. 1862. He fought at Port Gibson, Raymond, Jackson, and Champion Hill, commanded the centre at Vicksburg, and was appointed military governor of the town upon its capture. In November 1863 he was made commander of the Fifteenth corps, which he led until the fall of Atlanta, save for a short period when in command of the army of the Tennessee. He then returned to take part in the Lincoln presidential campaign, but rejoined his corps, continued with it till Johnston's surrender, 26 April 1865, and afterward for a time commanded the Army of the Tennessee. In 1866-9 he sat in the 40th and 41st congresses as a Republican, and was also re-elected to the 42d, but before taking his seat was chosen by the Illinois legislature to the Senate, where he served from 1871 to 1877. He began legal practice in Chicago, but on 18 March 1879 again entered the Senate. While in Congress he distinguished himself by his eloquence. He was consistently opposed to the restoration of Fitz-John Porter to the army, and in June 1880 made a four-days' speech on the Porter bill. At the Republican national convention in Chicago in June 1884, he was a candidate for nomination to the Presidency, and after Blaine's nomination was nominated Vice-President by acclamation. Shortly after the defeat of this ticket, Logan was again chosen Republican senator from Illinois. Blaine said of him: "While there have been more illustrious military leaders in the United States and more illustrious leaders in legislative halls, there has, I think, been no man in this country who has combined the two careers in so eminent a degree as General Logan." Consult the 'Life' by Dawson (1887).

Logan, Mary Simmerson Cunningham, American editor and journalist: b. Petersburg, Boone County, Mo., 15 Aug. 1838. She was married to John A. Logan (q.v.) in 1855 and since his death, in 1886, has edited 'The Home Magazine,' has contributed frequently to periodicals and has been editorially associated with the 'American Journal.'

Logan, Olive, American actress, lecturer and author: b. Elmira, N. Y., 16 April 1841; d. Bunstead, Eng., 27 April 1909. She began her career in Philadelphia in 1854; retired from the stage in 1868 and became a lecturer on social topics. She published 'Chateau Frissac' (1865); 'Photographs of Paris Life' (1861); 'Women and Theatres'; and 'Before the Footlights and Behind the Scenes: a Book about the Show Business' (1870).

Logan, Stephen Trigg, American jurist: b. in Franklin County, Ky., in 1800; d. in 1880. After studying law and for a while practising in Kentucky he removed (1832) to Springfield, Ill., and there continued in the work of his profession. He became a circuit judge in 1835; was three times (1842, 1844, 1846) elected to the Illinois legislature; and was associated as law partner with Abraham Lincoln, from 1841 to 1844. He was one of those who in 1847 framed the new constitution of Illinois; was again elected to the legislature in 1854; joined the Republican party at its formation, and was a delegate to its national convention in Chicago in 1860.

Logan, Sir William Edmond, Canadian geologist: b. Montreal 20 April 1798; d. Castle Malgwin, Cardiganshire, Wales, 22 June 1875. He was educated chiefly in Edinburgh; was for a time a clerk in London, and afterward became manager of a copper-smelting works in Swansea. While there he devoted himself to the study of geology. In 1840 he went to Canada, and he was the chief of the Geological Survey of that country 1842–70. His writings appeared in the annual reports of the Canadian Survey; in the Proceedings of the British Association, the Geological Society, etc. He published 'Geology of Canada' (1863).

Logan, Ohio, village, county-seat of Hocking County; on the Hocking River, and on the Columbus, Hocking & Toledo railroad; about 45 miles southeast of Columbus. It is situated in the natural gas belt, and in the vicinity of some good farm lands. Nearby is found clay suitable for pottery and bricks. Its chief manufactures are flour, furniture, brick for paving and building, pottery, foundry products, and machinery. The village owns and operates the waterworks. The public library has nearly 3,000 volumes. Pop. (1910) 4,850.

Logan, Utah, city, county-seat of Cache County; on Logan River, and on the Oregon Short Line railroad; about 70 miles north of Salt Lake City. It was settled in 1859 and incorporated in 1866. It is located in an agricultural region with valuable mineral deposits in the vicinity. The chief industrial establishments are knitting-mills, lumber-mills, a brewery, a beet-sugar factory, and flour-mills. Some of the educational institutions are the Brigham Young College, opened in 1878 under the auspices of the Latter Day Saints, New Jersey Academy, under the auspices of Presbyterians, and the State Agriculture College. The waterworks are owned and operated by the city. The city government is conducted on the commission plan, this being (1911) one of five such cities in Utah. Pop. (1910) 7,522.

Logan, Mount, the second highest peak in North America, Mount McKinley (q.v.) being first, in the southwestern part of the district of Yukon in Canada. Its height is 19,500 feet.

Lo'gansport, Ind., city, county-seat of Cass County, locally known as the "City of Bridges," 70 miles north by west of Indianapolis, where the Eel River flows into the Wabash. The city is an important railroad centre, being entered by the Chicago, Richmond, Bradford, and Effner divisions of the Pittsburg, C., C. & St. L. R.R.; the Michigan division of the Vandalia, and its 94-mile branch northeast to Butler; and by the Wabash. It is also the western terminal of the interurban line operated by the Fort Wayne & Wabash Valley Traction Company, and the northern terminal of the line operated by the Indiana Union Traction Company.

Industries. The business of the city is derived largely from its railroad shops (those of the P., C., C. & St. L. employing 1,000 men, the largest industry), from its manufactories, and from the surrounding agricultural region, the chief products being wheat, corn, oats, and small fruits. An important industry is the Western Motor Works, manufacturers of automobile and other motors, and gray iron, brass, and aluminum castings. Kenneth quarries, two miles west of the city limits on the north bank of the Wabash, furnish large quantities of crushed limestone.

Banks and Publications. Logansport has two national banks, one state bank, and one trust company, with a combined capitalization of $650,000, and one private bank not capitalized. There are published three daily, two semi-weekly, and five weekly newspapers, including one German paper.

Churches and Educational Institutions. The city has 16 Protestant and three Catholic churches. Its educational facilities are embraced in the Logansport Business College, Holy Angels' Academy (R. C.), a high school, the building being of Lake Superior red sandstone, and 8 ward schools, in addition to the Catholic and Lutheran parish schools.

Public Institutions, etc. Of these the most important is the Northern Indiana Hospital for the Insane, popularly known as "Longcliff," comprising 34 buildings, and 300 acres of land, at a total cost of $724,164.76, and opened 1 July, 1888. Saint Joseph's Hospital (R. C.), the Home for the Friendless, the Orphans' Home, the Carnegie Library erected in 1904 at a cost of $35,000, the Federal building completed in 1905 and costing $75,000, and the Masonic Temple, are among the more prominent institutions. The city also has three parks, Spencer Park, about a mile east of the city limits, Riverside Park on the Eel River, and Court Park. The Soldiers' Monument in Mount Hope Cemetery, costing $10,000, was dedicated 14 July 1887. The Logansport Home Telephone Company has 2,000 telephones and extensive connections with other places and the rural districts.

History, Government, and Population. Logansport was named after Captain Logan, a Shawnee chief, killed by the Indians in Nov.

1812, near the Maumee River, and was first written Logan's Port. The first permanent settlement was made in August 1826, by Alexander Chamberlain, who erected a log cabin on the south bank of the Wabash, directly opposite the mouth of the Eel River. It was incorporated as a town 5 Sept. 1831; as a city, 3 April 1838. Its elective officers consist of a mayor, judge, clerk, and treasurer, each for four years, ineligible for two consecutive terms; and seven councilmen, one from each of the five wards, and two at large. The business of the city is largely delegated to its Board of Public Works, which consists of three members, appointed by the mayor, and not more than two of which can belong to the same political party. The three police commissioners are appointed by the governor. The city also owns and operates its own electric light and water plant. Pop. (1910) 19,050.

Charles O. Fenton,
Editor 'Logansport Times.'

Log'arithms. The common logarithm of a number is the index of the power to which 10 must be raised to be equal to the number. Thus $10^3 = 1{,}000$, so that the logarithm of 1,000 (usually written log. 1,000) is 3. Now $10^1 = 10$, $10^2 = 100$, $10^3 = 1{,}000$, $10^6 = 1{,}000{,}000$, and it is well known that $10^0 = 1$, $10^{-1} = 0.1$, $10^{-2} = 0.01$, etc., thus:

Log. 0.001 = −3
Log. 0.01 = −2
Log. 0.1 = −1
Log. 1 = 0
Log. 10 = 1
Log. 100 = 2
Log. 1,000 = 3
Log. 10,000 = 4

It is evident that the logarithm of any number greater than 1 and less than 10 is fractional; the logarithm of any number greater than 10 and less than 100 is greater than 1 and less than 2. Again, the logarithm of any number less than 1 is negative. The logarithms of numbers have been calculated by Napier, Briggs, Mercator, Newton, Leibnitz, Halley, Euler, L'Huillier, Vlacq, Sherwin, Gardner, Hutton, Taylor, Callet, and others. Of works giving tables of logarithms we may mention those to which the names of Hutton, Callet, and Vega are respectively attached. Chambers' Mathematical Tables is a useful little treatise; it gives logarithms of numbers to seven places of decimals. Suppose we wish to know the logarithm of the number 18.1. In a book of tables we only find the fractional part of the logarithm, it is .257679. Now 18.1 is greater than 10 and less than 100, so that its logarithm is greater than 1 and less than 2; hence log. 18.1 = 1.257679. To give examples:

Log. 18100 = 4.257679
Log. 1810 = 3.257679
Log. 181 = 2.257679
Log. 18.1 = 1.257679
Log. 1.81 = 0.257679
Log. 0.181 = $\bar{1}.257679$
Log. 0.0181 = $\bar{2}.257679$
Log. 0.00181 = $\bar{3}.257679$

$\bar{3}.257679$ means $-3 + 0.257679$. For a full explanation of the finding of logarithms and natural numbers by the tables see treatises on trigonometry, etc. The integral part of a logarithm is called its characteristic, the fractional part its mantissa. Logarithms make arithmetical computations more easy, for by means of a table of them the operations of multiplication, division, involution or the finding of powers, and evolution or the finding of roots, are changed to those of addition, subtraction, multiplication, and division respectively. For instance, if x and y are the logarithms of any two numbers, the numbers are 10^x and 10^y; now the product of these numbers is 10^{x+y}, so that the logarithm of the product of two numbers is the sum of the logarithms of the numbers. Again, the quotient of the numbers is 10^{x-y}; so that the logarithm of the quotient of two numbers is the difference of the logarithms of the numbers. Again, 10^x raised to the nth power is 10^{nx}; so that the logarithm of the nth power of a number is n times the logarithm of the number. Again, the nth root of 10^x is $10^{\frac{x}{n}}$; so that the logarithm of the nth root of a number is $\frac{1}{n}$th of the logarithm of the number. Hitherto we have spoken of common logarithms, which were invented by Briggs; their *base*, as it is called, is 10. Now logarithms were first used by Napier of Merchiston (see Napier, John), and he employed a base which is smaller than 10, it is the number 2.7182818...., or the sum of the infinite series $2 + \frac{1}{2} + \frac{1}{2.3} + \frac{1}{2.3.4} +$, etc. This base is denoted by e in mathematical treatises, and the Napierian logarithm of any number, say 7, is $\log._e 7$, to distinguish it from log. 7, which is the common logarithm, whose base is 10. The common logarithm of a number is found from the Napierian by multiplying by 0.43429448. Napierian logarithms are of great importance in mathematics.

Log'cock, a local name for either of two birds: (1) the pileated woodpecker (see Woodpecker); (2) the woodcock (q.v.).

Log'gerhead Shrike. See Turtle.

Loggerhead Turtle. See Hawksbill.

Loggia, lŏj'a, a word used in Italian architecture with several significations. It was applied to a hall open on two or more sides, where there were pillars to support the roof. Such are the Loggia de' Banchi in Genoa, and the Loggia de' Lanzi in Florence. It is also applied to an open colonnade along the side of a building. The name loggia is also given to the large ornamental window consisting of several parts, which is often seen in old Venetian palaces; and lastly, it is used to designate a small airy hall, usually open on all sides, constructed on the roof of an edifice. See also Architecture.

Log'ging, a name given by lumbermen to the practice of rolling logs from whence they are cut, or drawing them on sleds or wagons, to the stream by which they are transported to the mill. In some places logs are thus moved from one point to another by means of flumes and waterways.

Logic. Logic is that philosophical science which deals with the principles and methods of all thinking. The processes of thought, although varied in form and content, have always a single end; to interpret the past and the present, and by means of such interpretation to forecast the future. It is by thinking that we are able the better to understand the experiences of today and the more wisely to prepare for the events of tomorrow. Any object of thought — a thing, a person, an event — if it is to be really grasped by the thinking mind and to become a part of our body of knowledge, must be correctly interpreted by us. And by interpretation is meant the revelation of its essential significance in the light of the universal principle or the universal nature which the particular object under investigation illustrates. The primary function of logic is this: the interpretation of the particular by means of the universal which underlies it. The development of all logical theory is merely the elaboration of this fundamental principle. To refer any object of consciousness to a universal is the sole method of describing its characteristics, or expressing its significance. If, for instance, I declare a certain plant to be poisonous, I have characterized it by an adjective which admits an indefinite variety of applications but preserves always one and the same essential significance, and this is the meaning and the function of the universal. Any noun which stands for a class or group of objects, or any adjective which may be variously applied, is a universal; or as it is technically known in logic—a concept. Moreover, the reference of any particular object of thought to a universal, *i. e.,* to a concept which serves to interpret it, is a judgment.

Inasmuch as the reference is always confronted with the possibility of error, it is of the very nature of a judgment to raise the question of its truth or falsity, according as the knowledge upon which it is based is accurate or inaccurate, adequate or inadequate. In the manifold conflict of opinion there is an obvious need of some definite and fundamental criterion to discriminate between the true and the false. The final court of appeal as to the truth or the falsity of knowledge must be to the main body of knowledge as a whole. This is the test: does the new experience square with our accumulated experience or not? Truth as regards its logical significance must measure up to this supreme standard, namely of consistency with all that constitutes the world of knowledge as we understand it. As the judgment is the logical vehicle of expressing truth, it is natural that it should take the form of a reference of the immediate object of consciousness to the general body of knowledge which has been already received, tested, and assimilated by the mind. Thus, every new experience is to be illuminated and interpreted by the old. This is the program of thought and the way of all logical procedure and progress. However, there can be no essential progress in thought when the judgment is merely the recognition of the appropriate place of a new thought in our general body of knowledge. Progress is manifest when the object of thought, in the light of our knowledge as a whole, gives rise to some new idea which is not expressed in the given object of thought alone, nor yet in our general body of knowledge alone, but which is nevertheless necessitated and revealed by the combination of the two sources taken together. Our general body of knowledge contributes a part, and the given object of thought contributes the other part. When brought together the two parts fuse into one, forming a complete whole. Thought in this sense is creative. The given elements at hand may be old, but thought constructs them into new forms, ever adding to the store of knowledge from the very elements which knowledge itself furnishes. This process is the consummation of all the various logical functions and is known as the process of inference. Inference is possible because our judgments contain more knowledge than they ever express upon the surface. There is a deposit of knowledge which is implicit in every judgment, and this is due to the fact that all of our judgments are interrelated and interdependent. The complete significance of a judgment is revealed only in the light of all its relevant and cognate judgments. The implicit becomes explicit only when a given judgment is brought into relation to some other judgment which has already been tested and found place in our body of general knowledge; this is what occurs in the process of inference. For instance, if it is asserted that a bar of soft iron will become a magnet if an electric current is allowed to pass through a coil of wire wound about it, such an assertion is based upon our general knowledge which is contained in the judgment that a current of electricity passing through a coil of wire always transforms an iron bar within the coil into a magnet. Without this general knowledge the mere fact of having a coil of wire wound around a piece of iron would be meaningless. To have any significance such a fact must have the light of our general knowledge brought to bear upon it. Then only does the given fact become suggestive and fertile in the increase of knowledge. Or again, if in any triangle there are given the two angles and the included side, one can infer by means of the knowledge of trigonometrical principles the other angle and the remaining two sides. Such a process of inference consists in the combination of what is given with certain general principles which constitute a part of our body of knowledge. That which is given without the general principles to interpret and develop it in all of its implied bearings and relations would remain devoid of significance and with no value as knowledge whatsoever.

In inference, therefore, there is always the extension of our knowledge, for the given judgment contains something which is not apparent when observed in its own light simply, but which is revealed only in the light which plays upon it from our general body of knowledge as a central source of illumination.

The ground of inference, indeed, that which makes the inferential process a possibility at all, is the supposition which we are constrained to make and upon which we are constantly resting in the exercise of our reasoning faculty, namely, that the various elements which constitute our body of knowledge as a whole must be related to each other in such a way as to form a system of interconnected and interdependent parts. When we have given a single part, other parts of the whole to which the part belongs can be inferred, because of our knowledge of the general system which binds them together through the inner connections of necessity. That which is implicit in any judgment and which forms the germ of inference can be revealed only when one thoroughly understands the complete system of relations and connections which underlies the judgment in question. If our knowledge were not systematized, and the various parts duly related and properly co-ordinated and subordinated each to each, then there could be no basis for any inference, and no possibility of constancy and consistency in our thinking. As aids to systemization there are the processes of definition, division, and classification which are treated at length in textbooks on the formal logic and can only receive passing mention here.

While inference depends upon organized knowledge it is also instrumental in producing the very organization of our knowledge itself. It draws from it and at the same time it contributes to it. This two-fold function gives rise to the two kinds of inference, known as deductive and inductive. In deductive inference we proceed from our general knowledge to the characterization of the special case which depends upon it; or inasmuch as our general knowledge is expressed in the form of universal concepts we can put it simply—that deduction is from the universal to the particular. Induction, on the other hand, is from the particular case, or rather particular cases, to the universal. It is essentially a process of generalization, by which we rise in thought from the investigation of special cases to the universal principle or law which embraces them and underlies their nature. Inference is always either the interpretation or else the elaboration of knowledge. When that which is given is illuminated by some universal principle or law so that its implicit significance is thereby made explicit, we have the process of deduction. But when there is no recognized universal, and such is evidently to seek, then we turn naturally to the relevant instances before us so as to discover in them some suggestion of the desired law or principle. Such a procedure is induction. For example, when the physicist sees certain dark lines in the solar spectrum, he infers that they indicate the presence of iron vapor in the sun. This is deductive inference because it is a process of thought which rests upon the universal and well-known connection between certain definitely positioned lines in the solar spectrum and the presence of iron. On the other hand, however, suppose the investigator is ignorant of the meaning of these dark lines. In his knowledge they possess no significance whatever and suggest nothing to his mind. It is obvious that he must experiment in various ways with the phenomena of these lines until he is able to discover their general relations and significance. Then he will be able to formulate the results of his investigation in a universal law which not only shall embody the special cases coming under his observation but all others also of a similar nature. It will be readily seen that deduction and induction are complementary phases of one and the same process. With every special case which comes before consciousness one of two methods of procedure is possible, that is, if it is to be the subject of inference at all; if it evidently falls under some universal law or principle to which we do not hesitate to refer it, then it becomes invested with the full purport and significance of such a universal; if, however, there is no recognized universal to which we can refer it, the special case presents a problem for us to solve by experiment and observation, namely. what is the universal which we are constrained to believe must underlie it, and which the special case in some way not yet revealed necessarily illustrates. Whenever, therefore, we face a new experience, a new fact or event, we must treat it by one or the other of these two methods according as our knowledge is adequate to its interpretation or not. In the one case we are reasoning deductively; in the other, inductively. Where the limitations of knowledge obstruct progress in one direction, it is possible to proceed in the other direction so as to remove eventually these very limitations themselves. If we do not possess sufficient knowledge to suggest the appropriate universal from which to reason deductively, we can proceed in an inductive manner to search for the universal which invites our investigation.

In our thinking these two processes cannot be separated, for some elements in the phenomena under observation appear immediately illuminated by our knowledge, others again are not so illuminated but when properly tested are found to emit the light which is in them; these various elements are so closely joined together that the two processes must ever run parallel.

The form of inference which best illustrates the deductive reasoning, although by no means exclusively, is that of the Syllogism (q.v.). The syllogism is that method of reasoning which combines two judgments so as to produce a third; as for example:

Whatever turns blue litmus paper red is an acid. This compound turns blue litmus paper red. Therefore, it is an acid.

It will be observed that the two judgments which combine to produce the third have a term in common; this is called the middle term of the syllogism. Moreover, the third judgment or conclusion is proved by the process of eliminating the middle term, and taking as the subject and predicate of the conclusion the remaining terms of the given judgments. The subject of the conclusion is called the minor term; the predicate, the major term; and of the two given judgments, the one containing the major term is called the major premise, and the one containing the minor term, the minor premise. It is the peculiar function of the major premise to exhibit some aspect of our general knowledge; and of the minor premise to exhibit a more particular phase of our general knowledge, or as it more frequently occurs some special case embodied in a concrete experience. It is the combined function of the two together to apply some portion of our general knowledge to a special case so as to yield its true interpretation. It is impossible to discuss here at length the various rules by which the validity of the syllogism may be tested. It may be said, however, that the rules of the syllogism depend upon the fundamental principle that if a special case can be proved to fall within the area of a universal, then the inference follows that the special case becomes invested with the essential characteristics of the universal itself. But if the special case falls outside the scope of the universal, either wholly or in part, then the inference does not follow. For instance, in all cases at law the special case is referred to some law principle, that is, to a universal which completely covers its essential significance and thereby determines the issues of the trial with the attending damages or punishment. Whenever a judicial decision is reversed by a superior court it is because the special case under investigation did not properly come under the law principle to which it was referred. It is obvious that the syllogistic method of reasoning admits of abuse by connecting premises in a merely formal manner which have no real connection. Such an artificial and mechanical treatment of the syllogism leads naturally to empty subtleties and weak sophistries. It was this exclusive emphasis upon the formal and technical side of the syllogism that brought the writings of the schoolmen to such ill repute, so that the term scholastic has become suggestive of a complete divorce of thought from reality. Aristotle, to whom we owe the formulation of the syllogistic method of reasoning, placed supreme stress upon the real connection which must underlie all formal relationship in the structure of the syllogism. Thus he states that «the middle term must express the real cause,» *τὸ μὲν γὰρ αἶτιον τὸ μέσον*. Anal. Post. ii. 2, 90A 6.

The force of Aristotle's observation will be appreciated if we trace the usual process of thought whenever any judgment of ours is questioned. Suppose that one asserts that there is going to be a storm within a few hours, and he is asked concerning the ground of his opinion. The reply would be that there is a rapidly falling barometer, and also that a rapidly falling barometer indicates an approaching storm. Here the middle term, «rapidly falling barometer,» serves to unite the universal judgment to the special case as observed and at the same time to connect the two parts of the reasoning process by a real tie representing the underlying cause upon which they are based. Inference, indeed, is often defined as the process by which the ground of a judgment is explicitly disclosed.

The ordinary categorical syllogism, that is, one which is formed of judgments in the simple form, x is y, although it is essentially grounded in the causal relation, nevertheless in a large measure conceals it. On the other hand, in the hypothetical syllogism, whose major premise is a hypothetical judgment, that is, of the form, If x is y, z is w, and whose minor premise affirms or denies one of these two clauses categorically, the causal relation is brought into the foreground, inasmuch as it states explicitly a consequence as dependent upon its ground. There is still another kind of syllogism known as the disjunctive syllogism in which the major premise is a disjunctive judgment that is of the form, x is either z or w, and the minor premise is an affirmation or denial of one of these alternatives while the conclusion is the corresponding denial or affirmation of the other. This affords a method of reasoning by elimination, and is most useful in deciding between possibilities. In this form of the syllogism the causal relation is not expressed on the surface at all, but is essentially implied; for in order to state possibilities one must know all of the underlying causal relations of the system in which these possibilities emerge. For instance, one cannot state that the contents of a stomach which have been chemically examined indicate the presence of arsenic or antimony unless there is known also the exact causal connection between these two poisons and the partially digested food; the disjunctive judgment standing as the major premise of the disjunctive syllogism always presupposes some definite knowledge of determining causal relations which exist in the system under consideration.

The validity of the syllogism turns, as will be readily seen, upon the possibility of referring a special case to its appropriate universal. But there are often situations and circumstances when this method of reference is not at all possible and yet nevertheless a valid inference can be drawn. In other words, the syllogistic procedure by no means exhausts the possibility of deductive inference. There may be other relations which grow out of a system of interconnected parts and which are of such a nature as to warrant an inference from them. For instance, we may have the following inference:

The two angles of a triangle, A and B, equal 95°. Therefore, the third angle must equal 85°.

This is not a syllogism proper and yet is a perfectly valid course of reasoning. While there is no middle term there is an identical point of reference, namely, the given triangle; and there is also the universal upon which the inference depends, namely, the relations which underlie the very nature of the triangle itself and are rendered constant by it. Thus, all of the essentials of inference are found to be present in such a form of reasoning. Various kinds of inference may thus arise according to the different relations which may obtain in the system wherein they occur. To have a valid inference in any such case we must establish some identity of relation between the parts which we are comparing; otherwise we cannot logically pass from one to the other. And identity of relationship can be established only in systems of such simplicity that no unknown elements which might enter to disturb the existing relations can be conceived. Our thought in other words must command the system completely; otherwise we are never justified in using our knowledge as the basis of reasoning.

In the inductive process as we have seen, the procedure is from particular instances to the universal which underlies them and which they illustrate; there is here, however, an evident break in the continuity of the logical process. The conclusion contains more than the premises; for in the universal reached by induction our knowledge goes beyond our actual experience. This is the so-called «inductive leap» or «inductive hazard.» It is not, however, a leap in the dark. Such it would be, were we compelled to use the mere data of experience as the sole ground of our inferences. But it is possible to formulate as a postulate, some universal truth which the mind is constrained to assume and which serves to bridge the gap between the particular and the universal. This postulate has been variously expressed by different authors yet with substantially the same underlying significance in all. In the older logic this is put in the convenient formula of «the uniformity of nature,» that is—beyond the sphere of experience phenomena are supposed to behave under like conditions in the same manner as in the sphere of immediate observation and experiment. In the modern logic, the phrase «uniformity of consciousness» takes the place of "uniformity of nature," the latter being regarded as somewhat indefinite and as implying a view exclusively objective. By "uniformity of consciousness" is meant, that our knowledge must be consistent throughout with itself, part to part, and parts to the whole, and that the world for us is the world as it is constructed and interpreted by our knowledge. Whenever a concrete instance is present in consciousness it is to be regarded as having its appropriate place in a system of universal and necessary relations, so that a correct interpretation of the concrete case must reveal the universal element which underlies it and gives it a place and meaning in our world of knowledge. Nature after all is only another word for the world as we know it—a world of universal and necessary relations; otherwise it could not be a world of order and uniformity.

The one relation above all others which enables us to discover the universal significance of concrete instances is the relation of cause and effect. When in the phenomena of nature or the events of life, a simple causal relation can be discovered, even though it is illustrated only in a certain case, there is sufficient ground for the generalization of the connection thus discovered. The method of inductive investigation, therefore, consists in various tests for the exhibition of true causal relations of such a simple nature as to furnish evidence that these relations are both definite and constant. A complex relation is too indefinite and variable to warrant any generalization which is based upon it. But however complex the phenomenon may be, it may be always subjected to some process of analysis which will reveal a more simple causal relation underlying it. Moreover, it is necessary by proper inductive tests to discriminate between a causal connection and a mere coincidence. All of this is provided for in the so-called inductive methods—the method of agreement, of difference, of agreement and difference, of concomitant variation, and of residues. These are essentially the methods of scientific procedure, the methods of research and experimentation. The function of hypothesis in inductive investigation must not be overlooked. An hypothesis is a supposition which is made concerning the probable cause of a phenomenon either as preliminary to an experiment which may prove or disprove the supposition or in the place of an experiment or systematic observation when such are impossible owing to the peculiar conditions of the phenomenon itself. In the first instance the function of hypothesis determines the line of experiment in a definite manner and does not leave the phenomenon in question to indeterminate and haphazard investigation. This may be illustrated by a quotation concerning Charles Darwin, taken from the 'Reminiscences' of his son, Francis Darwin: "He often said that no one could be a good observer unless he was an active theorizer. It was as though he were charged with theorizing power ready to flow into any channel on the slightest disturbance, so that no fact however small could avoid releasing a stream of theory and then the fact became magnified into importance. In this way it naturally happened that many untenable theories occurred to him; but fortunately his richness of imagination was equalled by his power of judging and condemning the thoughts that occurred to him. He was just to his theories, and did not condemn them unheard; and so it happened that he was willing to test what would seem to most people not at all worth testing." ('Life and Letters of Charles Darwin,' Vol. I, p. 126.) But there is a second function of hypothesis,—where an explanation is needed to account for phenomena which it is impossible to reproduce in the form of an experiment. We are not always able to perceive the relations between facts and yet we are constrained to think of them as related; but in order to systematize them we must supply the *lacunæ* which appear in the phenomena as perceived. A supposition of this nature which is necessary in order to construct a body of facts into a system is an hypothesis,—as for instance the nebular hypothesis of Laplace. No course of reasoning, however, can be carried on to any extent or to any effect which does not combine the two processes of deduction and induction in a manner provided for by the complementary relation which they sustain one to the other. The combination of the deductive and inductive processes has been called by John Stuart Mill the Deductive method simply. A more distinctive name however would be,—the Inducto-deductive method. This combined method consists of three stages:—

1. A preliminary process of induction whose results may be expressed tentatively at least in the form of a universal law or principle.

2. A process of deduction based upon this universal principle or law as its major premise, and thus extending our knowledge to the determination of new cases which have not as yet gained a place in our body of knowledge.

3. A process of verification, by which the results of the process of deduction are compared with the facts as actually observed. When there is not an exact correspondence between the theoretically deduced results and the observed facts, and we are able to assure ourselves that there has been no flaw in the processes of deduction, then the original induction stands as so far forth discredited, and must be revised so as to square it with fact. This combined method of deduction and induction serves as a check on the one hand upon all tendency to hasty generalization, and on the other it is most valuable as a means of extending our knowledge into unknown regions beyond the sphere of immediate observation. We are constantly using our inductive results as a basis for a deductive inference concerning the things not yet seen; and then when seen, at once comparing the former inference with present fact we are either confirmed in the result which we had reached by the processes of reasoning, or else compelled to discard the earlier inference as false or inadequate as may be. The unseen which we are determining in our minds by what we think the seen necessitates we are however from time to time compelled to alter. Bacon has insisted that "anticipations of nature" are a source of innumerable errors, and that the truly scientific method consists in the interpretation of nature by means of direct observation and experiment simply. It must be remembered however that it is largely through these anticipations of nature that progress in science has been attained. A distinction must

be drawn between anticipations of nature which are subjected to careful verification and those which are in themselves regarded as final.

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Logic, Symbolic. Symbolic Logic, or Mathematical Logic, or the Calculus of Logic,—called also the Algebra of Logic (Peirce), Exact Logic (Schröder), and Algorithmic Logic or Logistic (Couturat),—covers exactly the same field as Formal Logic in general, but differs from Formal Logic (in the ordinary acceptation of that term) in the fact that greater use is made of a compact symbolism—the device to which mathematics owes so largely its immense development.

Formal Logic may be defined as that science which has for its object the complete analysis and systematic presentation of the principles and methods of deductive reasoning, or the type of reasoning in which conclusions are drawn from given premises. It is not concerned with the truth of the premises or of the conclusions, but simply takes care that if the premise is true the conclusion shall be; it is the study of the forms of valid inference without regard to the content or subject-matter of the propositions which are inferred or of those from which the inference is drawn. Symbolic Logic is then that treatment of Formal Logic which employs, instead of many of the words of ordinary language, a system of special symbols which secure not only greater precision and compactness, but also greater generality in its discussions. These symbols, like the symbols of mathematics, form, in reality, a new symbolic language; and it may be said that the choice of a convenient and accurate symbolism has been, in logic as in mathematics, an indispensable condition for the progress of the science.

A partial use of symbolism in Formal Logic is as old as the time of Aristotle; for example, 'If both *A* and *B* include the whole of *C*, it follows that some *A* is *B*.' What is called Symbolic Logic simply carries this device farther; it would express the whole of the above statement in symbols, as, for example, thus: $A \succ C \cdot B \succ C : \prec : A \curlyvee B$. The immense advantage that accrues from the full carrying out of this idea of Aristotle's can only be realized by those who have given some attention to mastering the details of the method.

The thorough-going application to Formal Logic of the symbolic method, with the accompanying extension of the field of logical inquiry, is a development of the latter half of the 19th century. The essential features of the modern theory, to be sure, were known to Leibniz as early as 1700, and some valuable contributions were made by Lambert in 1781; but the first work which brought the possibilities of the symbolic method forcibly to the attention of logicians was 'An Investigation of the Laws of Thought,' by George Boole, in 1854; and Boole is commonly regarded as the founder of the modern science. The new ideas did not at first meet with favor; the logicians, wedded to the classical methods, in which reasoning is carried on by means of living words, refused to admit what they called a mathematical intrusion into their science; while the mathematicians on their side regarded the whole movement as of no possible interest except to logicians. The field remained for some decades a no-man's land between mathematics and logic; the few who cultivated it worked largely without knowledge of previous or contemporary workers in the same field; and the difficulty of defining the relation of logical symbolism to mathematical form, and the limits of the analogy between them, led to many errors. By the end of the century, however, owing to the labors of Peirce and Schröder, the new methods had established themselves on a sound footing, and had proved their value in logical investigations. To mention only one illustration of their power, the Syllogism, and the so-called 'laws of thought' (namely, the principle of identity, the principle of contradiction, and the principle of excluded middle), have now been completely analyzed by the symbolic method, with results for which most logicians were not prepared: in the first place, it is now known that the three 'laws of thought' are entirely independent of one another, in the sense that no one is a necessary consequence of the other two; secondly, that the principle of the syllogism, in its primitive form, is not a consequence of the other three laws, but must be assumed as a separate principle; and finally that all four of the laws taken together are not sufficient for some of the most elementary processes of mathematical reasoning—that for these an entirely different discipline is required, namely, the Logic of Relations (see below). This example alone is sufficient to justify the assertion that the study of Symbolic Logic has put a wholly new spirit into the Logic of Aristotelian traditions, and has transformed a discipline which had remained nearly stationary since the Middle Ages into one of the most progressive of the modern sciences.

While this development was taking place in Logic, an equally important movement in a similar direction was being carried forward in the field of Pure Mathematics, and a brief account of this movement must be given before we can understand the present position of Symbolic Logic. Up to the middle of the 19th century, mathematics had been so busily engaged in testing the power of the newly acquired calculus of Newton and Leibniz, and obtaining results by its aid, that few inquiries had been made into the logical foundations of the theory. Since that epoch, however, increasing attention has been paid to these fundamental questions, among the early leaders being such men as Bolyai, Lobatchevsky, Cauchy, Weierstrass, Riemann, De Morgan, and Robert Grassmann, all of whom, except the first two, were contemporaries of Boole's. The first result of these inquiries was the recognition, more clearly than ever before, that every mathematical theory is based on a small number of fundamental hypotheses, or postulates, from which all the other propositions of the theory can be deduced, and careful lists of postulates are now being worked out for most of the important mathematical branches. Secondly, it became increasingly evident that the real interest of the mathematician lies not so much in the material content of the hypotheses which he assumes, as in the logical processes by which further propositions are deduced from those hypotheses. The natural outcome of this conviction was an immediate and very great extension of the field of mathematical inquiry. No longer confined to the study of number, quantity, and space, mathematicians invented for themselves new systems of hypotheses, and deduced from them new theories. Any set of postulates would serve, provided they involved no internal contradiction, and in the exuberance of new freedom, the subject-matter was sometimes chosen with an almost playful disregard of practical utility. Perhaps the most striking example of the new tendency was the acceptance of the non-Euclidean geometries of Lobatchevsky and Bolyai as legitimate branches of mathematics. These theories had at first been regarded as heretical, or at least as non-mathematical; but now, when it became clear that their assumptions, though unusual, were still not self-contradictory, they were assigned their proper places as hypothetical-deductive theories; they therefore became as much a part of mathematics as the older theory of Euclid, that theory being itself now recognized as a hypothetical-deductive theory; and the mathematical interest of either theory was seen to be quite independent of the question whether an illustration of it could or could not be found in the world of space-perceptions. Another example is that of Hamilton's quaternions, which is a new algebra in which the fundamental assumptions differ in several respects from the laws which hold in the more familiar algebra of quantity. Similarly, all the host of artificial algebras, the invention of which was promoted especially by Hankel (1867) and Benjamin Peirce (1870), are hypothetical-deductive theories exhibiting varying degrees of divergence from the ordinary algebra of quantity; perhaps the simplest of all these algebras is that invented by Boole himself for the purposes of symbolic logic. In arithmetic and geometry the work of Peano, Padoa, and Pieri in Italy, and of Pasch, Frege, and Hilbert in Germany, should be especially mentioned. Finally, the theory of abstract groups, and the whole operational calculus, are outgrowths of the same tendency. In short, pure mathematics came to be regarded, at the end of the century, as a collection of hypothetical-deductive theories, distinguished from one another by the nature of the assumptions adopted as the basis of each theory, but depending for their mathematical interest not so much on the material content of those assumptions as on the logical relations between the resulting propositions.

As the outcome of these two movements, therefore, the sciences of logic and mathematics found themselves in a wholly unexpected position at the beginning of the 20th century. Instead of being separate, almost antagonistic, disciplines, they suddenly discovered that they were both working in the same direction—that their problems and aims were identical. The field of symbolic logic, which had hitherto occupied a rather uncomfortable position between the two opposing forces, now became the common meeting-ground where mathematicians and logicians can work together to mutual advantage. The researches of Peirce and his pupils in America, and of Schröder in Germany, became more widely known. Peano and his school in Italy began the publication of the 'Formulaire de Mathématiques,' which is intended to become a complete cyclopedia of mathematical knowledge, expressed in the language of symbolic logic. Russell and Whitehead in England, and Couturat in France, became active exponents of the new mathematical-logical theory. Even the strictly mathematical researches of Georg Cantor began to arouse lively interest among the logicians. Finally, it remained for Russell (1903) to announce the surprising thesis that logic and mathematics are in reality the same science; that pure mathematics requires no material beyond that which is furnished by the necessary presuppositions of any logical thought; and that formal logic, if it is to be distinguished as a separate science at all, is simply the elementary, or earlier, part of mathematics.

It is too early to predict what the final outcome of this new movement will be; the limits of the inquiry are not yet well defined; the terminology and notation are still in an experimental stage; many important matters of detail are likely to remain for some time in debate; but at any rate this much is clear: a new program has been proposed for mathematics and logic, and the true nature and scope of what is now called symbolic logic cannot be finally determined until this broader question of the relation between logic and mathematics is decided. It may be that, in the merging of these two sciences, no place will be left for symbolic logic as a distinctive science; it may be that the studies now pursued under that name will be supplied with a more appropriate title; or it may be that some new form of symbolic logic will absorb the whole of logic and mathematics.

In view of these considerations it is clear that any account of the subject which can be given at the present time must be regarded as tentative and transitional—a snap-shot at a rapidly moving phenomenon—certain to become obsolete with the change of perspective which is taking place in all our mathematical-logical notions. The sketch which now follows, after this long introduction, must therefore be understood as containing not a body of universally accepted facts, but merely the writers' individual selection of some of the results which, in their view, seem most likely to become of recognized value.

The main results which Symbolic Logic claims to have secured are briefly the following:

1. A thorough-going investigation into the foundations of Logic,—an enumeration of appropriate groups of first principles (axioms and postulates) and the deduction from them of the whole structure.

2. The furnishing of a wonderfully concise and compact method of expressing premises and deductions from premises. It is impossible to overestimate the mastery which this gives over trains of thought.

3. A method for putting any number of premises, of any degree of complexity, into the intellectual mill, and extracting *all* the information which they convey about any term or any combination of terms, without the fatigue of conscious reasoning. Machines have been devised, like Jevons' "Logical Piano," by which these conclusions can be reached (not, however, in interesting forms) without even the aid of paper and pencil. The only difficulty is to find any *real* problems that are hard enough for this branch of the subject to attack.

These results have been due to:

(*a*) The generalization of the relation *is*, *implies* (made possible by the convention that "all a is b" does not involve the existence of a; this generalization is due to Leibniz).

(*b*) The introduction of the logic of *and* and *or* (there is no reason why Logic should not discuss, e.g., equivalences—perfectly common in real life—such as "The undevout astronomer is mad = Any astronomer is either mad or else devout").

(*c*) The introduction of the Special Terms, 0 and ∞ (nothing and everything, or the non-existent and the existent).

(*d*) The excision of the non-valid syllogisms, and hence the reduction of valid syllogisms to a perfectly symmetrical collection, all (universal and particular) tested by *one* simple and easy rule.

(*e*) The introduction of an appropriate symbolism.

As has already been intimated, much of the new matter of modern Logic has no necessary connection with its symbolism. The first four of the above improvements could perfectly well have been attained without its use; that they were not, is the greater proof of the utility and power of the symbolic method.

For the purposes of more detailed exposition, the subject may be divided into three parts:

(1) The Logic of Classes or Concepts;
(2) The Logic of Propositions; and
(3) The Logic of Relations;

although this can hardly be called a scientific division. (The use to which the term "Algebra of Logic" is now commonly restricted will be explained below.)

1. *The Logic of Classes or Concepts.*—In conducting any scientific inquiry, we usually, whether consciously or unconsciously, confine our attention to a particular realm of thought, which may be called the universe of discourse, or simply the *universe*, for that particular inquiry; any object outside the universe is irrelevant to the discussion. For example, astronomy deals with the universe of material objects on a large scale; anthropology deals with the universe of human beings; botany deals with the universe of flowers and plants; etc., etc. This universe, in any particular discussion, is represented by the symbol ∞, or by the symbol 1.

Within any given universe, we have to speak of classes, a *class* being a group of objects of thought which are distinguished in any way from the rest of the universe. The objects belonging to a class are usually characterized by the possession of certain common characters in which we are interested; and of these characters we then may form a "concept." But in Symbolic Logic we view a class merely as (in any way whatever) distinguished from the other classes of the universe.

Any class is represented in Symbolic Logic by a letter of the alphabet, and the complementary class, comprising all the rest of the universe, by the same letter with a dash or accent. Thus, in the universe of men, we may let a = the class of Americans, b = the class of bankers, and c = the class of Californians; then a' will represent the class of all foreigners, b' the class of all non-bankers, and c' the class of all men who do not live in California. Of course it is possible at any time to enlarge the borders of our universe, so that, for example, b' may come to mean not only all men who are not bankers, but also all things of any kind which are not bankers, as microbes, demonstrations, virtues. In any case, two classes x and x' together exhaust the universe considered, and have no part in common; either of two such classes is called the *negative* of the other. When a criterion, or means of distinguishing the objects of a class x from the rest of the universe, is so defined that no object in the universe will satisfy this criterion, it is convenient to speak of x as an "*empty*" or "*null*" *class*. Any null class is represented by the symbol 0. Thus, the class of all plane figures which are at the same time round and square, and the class of all prime numbers which end in the digit 4, are examples of null classes.

The common part of two classes x and y is represented by xy, and is called their *logical product*. Thus, in our example, ab = the class of American bankers, $a'b$ = the class of foreign bankers, $a'c$ = the class of foreign Californians (this last being of course a null class).

The class composed of two classes x and y together (whether or not these classes overlap) is represented by $x + y$, and is called the *logical* sum of x and y. Thus, $a+b=$ the class containing all Americans and all bankers; $a+a'b$, or the class containing all Americans and all foreign bankers, is of course the same class.

When two classes x and y are given, it may happen that every element of x is also an element of y; this relation is represented by $x \prec y$, and is the *fundamental relation* which may exist between two classes. Thus, in our example, $c \prec a$, since every Californian is also an American. If it happens that $x \prec y$, and at the same time $y \prec x$, we write $x=y$; that is, the symbol $=$ in logic is merely an abbreviation for two reciprocal relations $\prec$ between the terms which it connects.

Obviously $x \prec \infty$, whatever x may be; if it happens also that $\infty \prec x$, then and then only it will follow that $x=\infty$. Similarly, the equation $x=0$ is equivalent to the two relations $0 \prec x$ and $x \prec 0$, the first of which, like $x \prec \infty$, is tautologous, being true for every value of x.

We give next, without proof, a list of the principal theorems which have been discovered concerning the fundamental notions represented by ∞, 0, x', xy, $x+y$, and $x \prec y$. (The names attached to some of the theorems are the outgrowth of a varied and uncertain history, and do not always suggest very clearly the meaning of the theorem.)

1. $a \prec a$. (Principle of identity.)
2. If and only if $a \prec b$ and $b \prec a$, then $a=b$.
3. If $a \prec b$ and $b \prec c$, then $a \prec c$. (Principle of the syllogism; see also theorems 22 and 23, below.)
4. $a+a=a$ and $aa=a$. (Tautology.)
5. $a+ab=a$ and $a(a+b)=a$. (Absorption.)
6. $a+b=b+a$ and $ab=ba$. (Commutative laws.)
7. $(a+b)+c=a+(b+c)$ and $(ab)c=a(bc)$. (Associative laws.)
8. $a+(bc)=(a+b)(a+c)$ and $a(b+c)=(ab)+(ac)$. (Distributive laws.)
9. $a \prec a+b$ and $ab \prec a$. (Simplification.)
10. If $a \prec y$ and $b \prec y$ then $a+b \prec y$; and if $x \prec a$ and $x \prec b$, then $x \prec ab$.
11. If $a \prec bc$, then $a \prec b$ and $a \prec c$; and if $b+c \prec a$, then $b \prec a$ and $c \prec a$.
12. If $a \prec b$, then $a+b=b$ and $ab=a$.
13. If $a \prec b$ and $x \prec y$, then $a+x \prec a+y$ and $ax \prec ay$.
14. $0 \prec a$ and $a \prec \infty$.
15. $a+0=a$ and $a\infty=a$.
16. $a+\infty=\infty$ and $a0=0$.
17. $aa'=0$ and $a+a'=\infty$. (Principle of contradiction, or exclusion; and principle of excluded middle, or exhaustion.)
18. If $x \prec a$ and $x \prec a'$, then $x=0$; and if $a \prec y$ and $a' \prec y$, then $y=\infty$.
19. $(a')'=a$. (Double negation.)
20. If $a \prec b$, then $b' \prec a'$. (Contraposition.)
21. $(a+b)'=a'b'$ and $(ab)'=a'+b'$. (De Morgan's Theorems.)
22. If $ax+bx'=0$, then $ab=0$.
23. If $(a+x)(b+x')=\infty$, then $a+b=\infty$. (Theorems 22 and 23 are other forms of the principle of the syllogism.)
24. $\infty \neq 0$. (Postulate of existence.)
25. $$\begin{aligned}\infty &= a+a'\\ &=(a+a')(b+b')\ldots\\ &=ab+ab'+a'b+a'b'+\ldots\\ &=abc+a'bc+ab'c+\ldots\end{aligned}$$

and $0=aa'=aa'+bb'=aa'+bb'+cc'+\ldots$. (Formulæ for the complete development of ∞ and 0.)

26. $(pab+qa'b+rab'+sa'b')'=p'ab+q'a'b+r'ab'+s'a'b'$. (Formula for obtaining the negative of a well-developed expression,—of great utility in the solution of problems.)

In verifying the truth of these theorems, the familiar Eulerian circles may render some service by exhibiting to the eye the relations of the several terms; but Euler's diagrams become inadequate and even misleading in any really fundamental discussion, because they fail to represent satisfactorily the negative term, the complete introduction of which into modern logic is one of the most important enlargements of the subject. A better method of diagrammatic representation has been proposed by Venn (*loc. cit.*).

2. *The Logic of Propositions.*—We now turn to the second division of our subject, which will prove to be not a separate branch of the theory, but merely another aspect of the branch already considered.

In this branch of the subject, letters are used to represent not classes, but propositions, and the notation $x \prec y$ is used to express the relation: "the proposition x ***implies*** the proposition y," or "the truth of x entails the truth of y." For example, if $p=$ the proposition that John Smith endorsed this protested note, and $q=$ the proposition that he is liable for its payment, then $p \prec q$. Here, as in the logic of classes, the notation $p=q$ is used to express the double relation $p \prec q$ and $q \prec p$. When p is any proposition, then p', or p with a dash above it, represents the proposition contradictory to p, which is called the ***negative*** of p.

The notation pq, called the *logical product* of p and q, represents a proposition the assertion of which is equivalent to the simultaneous assertion of the propositions p and q; and $p+q$, called the *logical sum* of p and q, represents a proposition the assertion of which is equivalent to the alternative assertion of the propositions p and q. For example, if $p=$ "the testator was of sound mind," $q=$ "he acted freely," and $r=$ "his will is admitted," then $pq \prec r$, since the simultaneous assertion of p and q is sufficient to prove the truth of r (or, in the contrapositive form of the statement, $r' \prec p'+q'$); it happens that in this particular case we have also $p'+q' \prec r'$ (or its equivalent, $r \prec pq$), since if either p or q is false, the will is disallowed. Hence we may embody the complete statement of the situation in the equations $pq=r$ (or $p'+q'=r'$); but it must be constantly borne in mind that every such equation stands for the simultaneous assertion of two statements, the one a sufficient and the other a necessary condition.

Finally, the symbol ∞ is used in this theory to represent any typical true proposition, such as $2+2=4$; and the symbol 0 is used to represent any typical false proposition, such as $2+2=5$. These symbols enable us to express the assertion of the truth or falsity of any proposition as follows: $\infty \prec p$ is equivalent to the assertion "p is true"; and $p \prec 0$ is equivalent to the assertion "p is false." Obviously $0 \prec x$ and $x \prec \infty$ whatever the value of x; so that the relations $\infty \prec p$ and $p \prec 0$ may be replaced by $p=\infty$ and $p=0$, respectively. Two propositions, p and p', will be contradictory when and only when $p+p'=\infty$ and $pp'=0$.

If now we proceed to give the theorems which hold concerning the notions we have just represented by ∞, 0, x', xy, $x+y$, and $x \prec y$, we shall find that all the theorems 1–26 given in the previous section for the theory of classes hold also here, if the symbols are interpreted according to the theory of propositions. For example, the theorem: 'If a class a lies within the common part of two classes b and c, then it lies within b and also within c,' and the theorem: 'If a proposition a implies the simultaneous assertion of the propositions b and c, then it implies a and also implies b,' are each expressed by the same symbolic form, namely (11): 'If $a \prec bc$, then $a \prec b$ and $a \prec c$.' And so for each of the other theorems. This remarkable similarity between the theory of classes and the theory of propositions was stated by Leibniz, but was first fully developed by Boole.

As a most interesting example of the way in which compound propositions can be handled by the Logic of Propositions, we mention Mrs. Ladd-Franklin's 'inconsistent triad':

$$(ab=0)(b'c=0)(ac\neq 0) \prec 0;$$

since this is the form to which all the 8192 valid syllogisms (both universal and particular) can be reduced. By transposing the third factor, we have the universal syllogism: $(ab=0)(b'c=0) \prec (ac=0)$; and by transposing the second factor we have the particular syllogism: $(ab=0)(ac\neq 0) \prec (b'c\neq 0)$; the 'inconsistent triad' thus furnishes a perfectly general rule for testing the validity of any syllogism.

The Logic of Classes and the Logic of Propositions are included together in the 'Algebra of Logic' of Peirce and Schröder; in recent years, however, the term 'Algebra of Logic' has come to be used in a more mathematical sense, which will be explained in the following section.

The Algebra of Logic, strictly so called.—If we define *terms* in general to be any objects of thought which can be elements of an asserted relation—whether simple terms, like classes or concepts, or compound terms, like propositions, relations between propositions, etc.—we may say that the logic of classes and the logic of propositions have, formally, the same fundamental notions to deal with, namely: (1) terms, represented by letters of the alphabet; (2) two special terms, 0 and ∞; (3) three functions of terms: negations (x'), sums ($x+y$), and products (xy, or $x\times y$); and (4) the primitive relation between terms, expressed by $x \prec y$, which may itself (in its non-assertive form) be a term of a compound proposition; moreover, the theorems 1–26 are true formulæ in the one theory as well as in the other.

The theorems 1–26 are therefore capable of at least two interpretations: first, in the theory of classes, and secondly, in the theory of propositions; and there are doubtless many other theories also in which these formal statements can be given a concrete significance. It therefore becomes a natural inquiry to investigate this body of theorems in their abstract form (that is, without specifying any interpretation for the symbols), to study the logical relations that exist among them, and to select certain of them as fundamental, from which all the others can be deduced as formal consequences. The body of theorems so considered, with their consequences, forms a mathematical algebra, called (in distinction from the algebra of quantity, the algebra of complex numbers, the algebra of abstract groups, etc.) the *algebra of logic*. The algebra of logic bears the same relation to the ordinary algebra of quantity that the non-Euclidean geometries bear to the ordinary geometry of space; and it has been the analogy between the algebra of logic and the algebra of quantity that has led to the importation of several mathematical terms into the study of symbolic logic (as 'zero,' 'sum,' 'product,' etc.). The study of the algebra in this abstract form has brought out relations between the propositions of logic which might perhaps otherwise have remained unnoticed. As an example, it has been shown that the six fundamental notions: ∞, 0, x', xy, $x+y$, $x \prec y$ are not independent of one another, but that all may be defined in terms of any one of the last three; thus, theorems 15, 16, 17, and 12 may be used as definitions of ∞, 0, x', and $\prec$ in terms of $+$ and $\times$; while theorems 9 and 10 show how ab and $a+b$ can be defined in terms of $\prec$. Indeed it is hard to see how questions of the independence of the fundamental notions could have been discussed at all without the aid of the abstract algebraic method.—The most readable expositions of the algebra of logic from its mathematical side are given by Whitehead and Couturat (see bibliography). A searching inquiry into the nature of the algebra, and its relation to other branches of mathematics, was begun by Kempe in 1890, and has recently been carried farther by Royce (1905).

The Logic of Relations.—The Logic of Relations, or the Logic of Relatives, was founded, as regards first principles, by De Morgan ('Trans. Camb. Phil. Soc.,' vol. 10, 1864), developed by Peirce, carried further by Schröder, and has now met with what is possibly a farther important development in the hands of Russell (1903). We can give, in this space, only a cursory account of the principal terms which are employed.

In many inquiries we are concerned with the relation in which some term stands to some other term; for example, a number x may be less than a number y; a person A may be a debtor of a person B; a circle M may lie within another circle N: the notions 'less than,' 'debtor of,' 'within,' are *relations*. Every relation has a *converse* relation. For example, if x is less than y, then y is greater than x; if A is a debtor of B, then B is a creditor of A; if M lies within N, then N includes M. It is customary to represent a relation by a capital letter, as R, and the inverse relation by the same letter with a curved dash above it, as $\breve{R}$. Thus, if R stands for 'less than,' and $x=3$ and $y=5$, we have: xRy and $y\breve{R}x$. Again, if R stands for 'parent of,' $\breve{R}$ will stand for 'child of.'

If xRy and ySz, then x stands in a certain relation to z, called the *relative product* of the relations R and S and denoted by RS. Thus if xRy stands for 'x is brother of y,' and ySz for 'y is father of z,' then $xRSz$ will signify 'x is uncle of z'; or again, $xRSz$ may mean 'x is an agent of a landlord of z'; etc.

If a relation R is such that xRy always implies yRx, then R is called a *symmetrical* relation. For example, the relations «equal to,» «different from,» «spouse of,» are symmetrical relations. If R is such that yRx is false whenever xRy is true, then R is called an *asymmetrical* relation; as «less than,» «father of,» etc. Relations like «sister of,» which are neither symmetrical nor asymmetrical, are called simply not-symmetrical.

A relation R which is such that xRx for every value of x is called a *reflexive* relation, like the relation of equality, or the relation which we have denoted by $\prec$ in the preceding part of this article (see theorems 1 and 2).

Again, if a relation R is such that xRy and yRz together always imply xRz, then R is called a *transitive* relation. For example, «less than,» «less than or equal to,» «ancestor of,» etc., are transitive relations. The asymmetrical transitive relations are more important than any other relations in the exact sciences; for example, «less than,» «below,» «before,» «prior to,» are relations of this type. The recent paper by Royce, however, shows how the theory of these asymmetrical relations can be made to depend on the theory of a certain more fundamental symmetrical relation.

In conclusion, we may notice that the whole theory of arithmetical operations, like addition and multiplication, may be regarded as a part of the theory of relations; for, as M. Bôcher has pointed out, instead of saying: «two numbers a and b determine a third number c, called their sum,» we may say: «the three numbers a, b, and c satisfy a certain relation, say $R(a, b, c)$.» Relations of this type are more complicated than those described above, since they hold not between two terms, but between three or more terms.

Bibliography.—The most extensive treatise on this subject is E. Schröder's ‹Algebra der Logik,› in four volumes, begun in 1890; the last volume is being published posthumously by E. Müller. J. Venn's ‹Symbolic Logic› (1881, 2d edition 1894) is especially valuable for its historical references. The forthcoming ‹Manuel de Logistique,› by L. Couturat, may be expected to contain the clearest exposition of the whole subject, with an account of the most recent progress. A. N. Whitehead's ‹Universal Algebra› (1898), and L. Couturat's ‹L'Algèbre de la logique› (1905) treat the algebra of logic from the mathematical point of view. J. N. Keynes, in his ‹Studies and Exercises in Formal Logic› (1894), has developed the subject without mathematical formulation, but in a very useful way for one who approaches it from the point of view of the logician. Other references are the following: ‹Opuscules et fragments inédits de Leibniz,› ed. L. Couturat (1905); J. H. Lambert, ‹Neues Organon› (1764); A. De Morgan, ‹Formal Logic› (1847); G. Boole, ‹Laws of Thought› (1854; see above); A. Macfarlane, ‹Algebra of Logic› (1879); W. E. Johnson, ‹Mind› (new series, vol. 1, 1892); H. McColl, ‹Proc. Lond. Math. Soc.› (vol. 9, 1877), and later papers; C. S. Peirce, ‹Amer. Journ. of Math.› (vols. 3, 4, 7), ‹Proc. Amer. Acad. of Arts and Sci.› (vols. 7, 10, 13), ‹Memoirs› of the same (vol. 9), ‹Studies in Logic by Members of the Johns Hopkins University› (1883); Christine Ladd, now Mrs. F. Franklin, ‹Studies in Logic, etc.› (1883), and later papers; O. H. Mitchell, ‹Studies in Logic, etc.› (1883); C. Frege, ‹Begriffsschrift› (1879), E. Müller, ‹Ueber die Alg. d. Logik› (1900, 1901); G. Peano, ‹Formulaire de Mathématiques› (1895, and later editions); E. V. Huntington, ‹Trans. Amer. Math. Soc.› (vol. 5, 1904); A. B. Kempe, ‹Proc. Lond. Math. Soc.› (vol. 21, 1890); J. Royce, ‹Trans. Amer. Math. Soc.› (vol. 6, 1905); B. Russell, ‹Rev. de Math.› (vol. 7, 1901), ‹Principles of Mathematics› (vol. 1, 1903).

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Log'os (Greek λόγος, from λέγειν, to speak), word, language, speech in general. Language being peculiar to man as a reasonable being, and speech presupposing thought, *logos* signifies reason, the faculty of thinking in general. Thus *logos* has the meaning both of thought and utterance. In Christian theology this term, as used in certain passages of the Scriptures, has been the source of continual disputes ever since the 3d century of our era. The passage in the Bible which gives rise to this discussion is the opening of the Gospel of St. John: «In the beginning was the Word, and the Word was with God, and the Word was God. The same was in the beginning with God. All things were made by him, and without him was not anything made that was made,» etc. In the Greek text the expression here translated «Word» is *logos*. What is here to be understood by *logos*, what is its essential character, whether it is a person of the Deity or not, the creative intellect of God, or the Son, through whom he created, or the divine truth which was to be revealed, etc., this is not the proper place to examine, nor will our limits permit us even to enumerate the different opinions which have been entertained on this interesting point of Christian metaphysics. We can refer the reader to no better source of information than Neander's ‹General History of Christianity and the Church.› The generally received doctrine of the *logos* makes it a person and not a mere name, and maintains that the Word is called *God*, not by catachresis, but in the strict and rigorous meaning of the term; that the most ancient Fathers of the Church always taught the divinity of the Word, and that they derived the idea from the Holy Scriptures alone, and not from the Platonic philosophy as many have asserted. On the contrary, it is held that the Hebrew conception of the *logos* is of independent origin, though it was natural that in the New Testament the Greek word should be adopted to express it. Some of the opinions of modern theologians on the meaning of the *logos* are as follows: It is necessary, some say, in order to understand the true meaning of *logos*, to begin with the examination of Wisdom (*sophia*), which was previously used to express the same notion. (See the Book of Proverbs, viii. 1, seqq., and the Book of Wisdom, vii. 22, seqq.) The poetical author of the Proverbs does not imagine a person separate from God, but only an interior power of God, because in his time there could be no idea of a being proceeding from God, the Jews having borrowed this notion at a later period from the oriental doctrine of emanations. The author of the Book of Sirach (xxiv. 3) first uses «The Word» (*logos*) of God as equivalent to «Wisdom» (*sophia*), to signify the almighty power of God. The Word being an act of wisdom gave rise to the symbol. John speaks of the *logos* in the beginning of his Gospel only, and afterward uses the expression *pneuma tou theou*. From his representation, the following positions have been deduced: the *logos* was (a) from the beginning of all thing (comp. Proverbs viii. 22; Sirach xxiv. 9); (b) from the beginning with God (comp. Sir. i. 1; Wisd. Sol. x. 16; ii. 14; Sir. xxiv. 12). St. John, therefore, says those who thus interpret him, had the same idea of the *logos* as the apocryphal writers; for the circumstance that the latter ascribe to the *logos* the creation of all things, while St. John leaves this point undecided in his *en archē ēn* (in the beginning was), does not amount to a contradiction. Others, particularly the earlier commentators, understand by *logos* the Deity himself, that is, the second person of the Deity (according to St. John viii. 58). But those who adhere to the former opinion maintain that this is in contradiction to John xiv. 28; xii. 49, 50; v. 19, 20; and that he understood by *logos* only a power of God, which was communicated to Jesus, on account of which he could claim divine attributes and yet call the Father, as the source of this power, greater than himself. Others, as Herder, Paulus, Eckermann, understand by *logos* the Word of God, which, in the Old Testament, as the expression of the will of God, is the symbol of his creative power (Gen. i., et seq.). The later Jews represented the divine omnipotence by the Word of God. But it is maintained, on the other hand, from the manner in which John speaks of the *logos*, that he understood by it not merely omnipotence, but the Omnipotent. Others following the Fathers of the Church, particularly Eusebius, understand by *logos* an independent substance, external from God, like the *nous* (intellect) of Plato. But this again, it is said, involves an error, because Plato means by *nous* only a power of God. Still others, as Mosheim, Schlegel, Jerusalem, declare with Irenæus the *logos* of St. John to be identical with the *logos* of the Gnostics; but it is objected that John did not conceive of a plurality like that in the doctrine of æons. Lange considered *logos* equivalent to the *sophia* of the Old Testament, and that to the *logos* of Philo, and as a distinct person from God; but, say the others, *sophia* is not something distinct from God. Paulus, in his Commentary, also identifies the *logos* of Philo with that of St. John. But it is said, on the other hand, that John cannot be supposed to have been acquainted with Philo's notion, as it was not an opinion current at the time, and that the view of the apocryphal writers is more in harmony with his; moreover, that if St. John means anything more than an original, external power in God, his «was God» (St. John i. 1) would imply dualism. Döderlein and Storr translated the word *logos* by *doctrina*, the abstract being put for the concrete, *doctrine* for *teacher*, as in Gen. xlii. 38; 2 Sam. xxii. 23; Luke iv. 36. According to others, *ho logos* means *ho legomenos* (the promised). The ancient philosophers often distinguish two *logoi* an interior in God or man which merely thinks (*logos endiathetos*), and an exterior or uttered (*logos prophorikos*).

Log'wood, the heart-wood of the *Hæmatoxylon Campechianum*, a leguminous tree which grows wild, in moist places, along the eastern shores of Mexico and Central America. From its abundance in some parts near the Bay of Campeachy it is sometimes called *Campeachy-wood*. The leaves are pinnate; the flowers small, yellowish, and disposed in axillary racemes at the extremity of the usually spinous branches. The wood is red, tinged with orange and black, so heavy as to sink in water, and susceptible of receiving a good polish; and it yields an extract much used in dyeing. (See Dyes.) Though cultivated to some extent in Jamaica, the logwood of commerce is chiefly obtained from Honduras, where the cutting of it forms an extensive but unhealthy branch of business. Haiti and San Domingo also produce much. The finest kind comes from Campeachy, the inferior qualities from Honduras and Jamaica, to which island it is not indigenous, but where it grows abundantly since its introduction. In the preparation of this wood for use, the trees, which are from 20 to 50 feet high, are cut down, the bark and alburnum removed, and the hard centre parts cut up into 3-foot-long logs. It is afterward hewn into much smaller pieces, and ground or rasped to small chips. The aqueous extract is muddy and of a reddish-brown color. By acids the red color is made paler; by alkalies it is converted to purple. Salts of iron, aluminum, and lead give precipitates of a blue, violet, or purple color. Logwood is chiefly consumed in dyeing cotton cloth, silk, wool, and leather; by mordanting the fabric with iron, black is produced; with alumina, violet and lilac; with copper, blue; and with chromium, a black or green—the exact tint depending on the composition of the mordants and logwood liquors, and the mode of application. The coloring power of logwood depends chiefly on a crystalline ingredient called *hæmatoxylin* (q.v.). In medicine both the extract and the decoction of logwood are used to some extent. The former is prepared by exhausting the wood with boiling water, filtering, and evaporating to a thickish syrup; the latter is the watery extract of the wood along with some cinnamon. Both are used as astringents in diarrhœa and dysentery.

Lohengrin, lō'ĕn-grĭn, the hero of an old German poem, written in the end of the 13th century. Rückert's edition (1857) of the poem is the best. The poem is a continuation of Wolfram von Eschenbach's 'Parzival.' Wagner made it the subject of his great opera, 'Lohengrin' (1848).

Loire, lwär (anc. *Liger*), France, the largest river of the country, dividing it into two nearly equal portions. It rises on the western slope of the Cévennes, in the department of Ardèche, and flows generally northwest and west to its outlet in the Bay of Biscay below Nantes. Its principal affluents on the right are the Arroux, Nièvre, Maine, etc.; on the left the Allier, Vienne, Cher, Indre, etc. Below Nantes, it is more a tidal estuary than a river, and is studded with islets. Above Nantes navigation is much impeded by shallows. Its whole course is about 645 miles, of which about 450 miles are navigable. The river is subject to disastrous inundations, and dikes (levées) have been constructed along its course. It is connected by canals with the Saône, Seine, and Vilaine.

Loki, lō'kē, in mythology, the god of strife and spirit of evil. He artfully contrived the death of Balder, when Odin had forbidden everything that springs «from fire, air, earth, and water» to injure him. The mistletoe not being included, was made into an arrow, given to the blind Höder, and shot at random; but it struck the beautiful Balder and killed him. This evil being was subsequently chained with 10 chains, and will so continue till the twilight of the gods appears, when he will break his bonds; then will the heavens disappear, the earth be swallowed up by the sea, fire shall consume the elements, and even Odin, with all his kindred deities, shall perish.

Lokman, lŏk-män′, a name that figures in the proverbs and traditions of the Arabians. According to tradition Lokman was a scion from the stock of Ad, and was once sent with a caravan from Ethiopia to Mecca to pray for rain in a time of great drought. But God's anger destroyed the whole family of Ad except Lokman, the only righteous one, whereupon the Creator of the world gave him his choice to live as long as the dung of seven gazelles, which lay in an inaccessible hole in a mountain, should last, or for a period equal to the lives of seven successive vultures. Lokman chose the last, and lived for an almost incalculable length of time. The fables bearing the name of Lokman were for the first time made known to Europe through the press in 1615. They were first published in Arabic, with a Latin translation, were afterward appended to an Arabic grammar, published by Erpenius at Leyden, and have since gone through many editions. The most complete manuscript of the fables of Lokman is in the library of the Vatican, in Persian.

Lola Montez. See MONTEZ, LOLA.

Lolach. See LEPIDOSIREN.

Lollardism, lŏl′ạr-dĭzm, in Great Britain, the tenets of the followers of John Wyclif. The views of Wyclif underwent a process of development as his researches and experience extended, and were by no means the same at all periods of his life. In so far as they departed from Roman Catholicism, they approached and, in some cases, went beyond what subsequently became the doctrine and discipline of Calvinism or Puritanism, commingled with an antagonistic element, Erastianism. Among the articles pronounced «heretical» by an assembly of ecclesiastical notables, convened in London in 1382 by Wm. Courtnay, archbishop of Canterbury, were these:

"1. That the substance of material bread and wine doth remain in the Sacrament of the Altar after consecration.

"3. That Christ is not in the Sacrament of the Altar truly and really in His proper corporeal person.

"5. That if a man be only contrite, all exterior confession is to him superfluous and invalid.

"7. That it hath no foundation in the Gospel that Christ did ordain the mass.

"8. That if the Pope be a reprobate and an evil man, and consequently a member of the devil, he hath no power over the faithful of Christ given to him by any, unless, peradventure, it be given him by the emperor.

"9. That after Urban VI. none other is to be received as Pope, but that Christendom ought to live after the manner of the Greeks under its own laws.

"10. That it is against the sacred Scriptures that ecclesiastical persons should have any temporal position."

Among 14 articles adjudged to be «erroneous» were the following:

"13. That a prelate or bishop excommunicating a cleric who hath appealed to the king or the council of the realm, in doing so is a traitor to the king and the realm.

"15. That it is lawful for any deacon or presbyter to preach the Word of God, without the authority or license of the Apostolic See, or of a Catholic bishop or of any other recognized authority.

"17. Also that temporal lords may at will take away their temporal goods from churches habitually delinquent.

"18. That tithes are pure alms, and that parishioners may for the offenses of their curates detain them, and bestow them on others at pleasure, and that tenants may correct delinquent landlords at will.

"24. That friars are bound to get their living by the labor of their hands, and not by begging.

See also DOLLARDS.

Lollards, lŏl′ạrdz, a name which arose in the Netherlands in the 14th century, and which during that and the following century was applied somewhat indiscriminately as a term of contempt to various sects or fraternities deemed heretical by the Roman Catholic Church. Different accounts are given of the derivation of the name. According to one opinion the name was first applied to a fraternity formed about the year 1300 at Antwerp, the members of which devoted themselves to the care of the sick and the burial of the dead, and were called Lollards from the Low German *lollen* or *lullen*, meaning to sing in a low tone, from the subdued and plaintive dirges that they were in the practice of singing while accompanying dead bodies to the grave. According to another opinion the name was first bestowed upon the followers of one Walter Lollard, who preached peculiar doctrines both in England and on the Continent between 1315 and 1322, till in the latter year he was burned as a heretic. Whatever may have been the origin of the name, it became well known in England about the end of the 14th century, when it was applied to the followers of Wyclif. See LOLLARDISM.

Lolos, lō′lōz, an aboriginal fair-complexioned people of China, inhabiting the Ta-liang-shan mountainous country, lying between the Yangtse River on the east and the Kien ch'ang valley on the southwest in Sze-chuen, and also found scattered on the Burmese and Tibetan frontiers. They are divided into tribes governed by hereditary chieftains, and maintain an independent position, frequently warring on their peaceable Chinese neighbors, and making slaves of them. They are descendants of aborigines who were driven southward by the immigration and increase of the Chinese.

Lomami, lō-mä′mē, Kongo Free State, a navigable river of Central Africa which rises near Kazaidi (Msoa), and after flowing almost parallel with the upper course of the Kongo River, enters the latter at Isangui several miles below Stanley Falls.

Lom′ax, Lindsay Lunsford, American soldier: b. Newport, R. I., 4 Nov. 1835. He was graduated from the United States Military Academy in 1856, entered the 2d cavalry, but later resigned from the United States army, became a captain in the Virginia State troops, and 29 April 1861 was made captain in the army of the Confederate States and assistant adjutant-general to General J. E. Johnston. In February 1863 he was appointed colonel of the 11th Virginia cavalry, in July 1863 brigadier-general, and in August 1864 major-general. He commanded a brigade under Fitzhugh Lee, a division under Early, and 1865 was made commander of the valley district. He took part in all the battles in which his portion of the Army of Northern Virginia fought, and surrendered with Johnston at Greensboro, N. C. After the War he was employed in the war records office at Washington, D. C.

Lombard, lŏm'bard, **Peter,** also known under his Latinized name, PETRUS LOMBARDUS, Italian theologian: b. Lugelogno, near Novara, Lombardy, about 1100; d. Paris 20 July 1164. He was a scholar of Abelard, and traditionally the first doctor of the University of Paris. He then became a teacher of theology, and in 1159, bishop of Paris. In his 'Sententiarum Libri Quatuor,' which became the subject of almost countless commentaries, and until the Reformation had almost classical authority among theologians, he placed the opinions of the Fathers, particularly Augustine, in regard to doctrines under certain titles, and then stated the objections made to them and the answers given by church authorities, but without offering any judgment of his own. The name of his work has given him the surname of Master of Sentences. Consult 'Life' by Protois (1881).

Lombard Architecture. See ARCHITECTURE.

Lombard College, a coeducational institution founded, in 1851, in Galesburg, Ill., under the auspices of the Universalists. In 1910 there were connected with the school 13 instructors and 120 students. The library contains about 8,000 volumes. It has a preparatory department and a classical department. The degree A. B. is conferred on those completing the classical course.

Lombard Street, a short street in London, which received its name from having been the residence of the Lombards, the money-lenders of former times, whose usurious transactions caused their expulsion from the kingdom in the reign of Elizabeth. It is now chiefly occupied by bankers, and is a place of much importance in the London commercial world. It is the English equivalent of Wall Street.

Lom'bards, Longobardi, or **Langobardi,** a Germanic or Teutonic people who at the beginning of the Christian era were dwelling on the lower Elbe. They make little appearance in history till the 6th century, when, under their king Alboin, they entered Italy in April 568, and, with the help of Saxons and others, conquered the northern portion, which hence received the name of Lombardy. From 713 to 744 the Lombards had a powerful king in the person of Liutprant, who extended his sway, at least temporarily, over the whole of Italy. From that time the power of the Lombards gradually declined, and finally Charlemagne captured Pavia after a six months' siege, and put an end to the Lombard kingdom (773 or 774), the last monarch being Desiderius.

Lombardy, lŏm'bar-dĭ, Italy, an ancient kingdom, now a northern compartimento embracing the eight provinces of Bergamo, Brescia, Como, Cremona, Mantua, Milan, Pavia, and Sondrio, with an aggregate area of 9,297 square miles and a population in 1901 of 4,282,728, or 460.66 to the square mile. It comprises that portion of Upper Italy which took its name from the Longobardi or Lombards. (See LOMBARDS.) After the fall of the Lombard kingdom this territory remained attached to the empire of Charlemagne and his successors till 843, when an independent kingdom of Italy arose, out of which in process of time a number of independent duchies and marquisates (Friuli, Mantua, Susa, etc.) or republics (Venice, Genoa, Milan, etc.) were formed. When Austria acquired the duchies of Mantua and Milan these provinces were called Austrian Lombardy, a name which they retained till Napoleon formed in 1797 out of them and other districts the Cisalpine, afterward the Italian Republic, and at last, in 1805, the kingdom of Italy. By the Peace of Paris, 1814, and the act of the Congress of Vienna, 1815, Austria received back its old Lombard possessions; but in consequence of the war of 1859 was compelled to cede them to Victor Emmanuel, king of Sardinia, by the Peace of Zürich, and in the following year they became part of the kingdom of Italy.

Lombok', East Indian Archipelago, one of the Lesser Sunda islands, east of Java, between Bali on the west and Sumbawa on the east. Area 3,136 square miles. The island is mountainous and of volcanic origin. Between the two ranges which traverse the island, one of them rising to the height of 11,800 feet, there is a plain fertile in rice, cotton, maize, coffee, and tobacco. The upper and former ruling class are Brahmans, and the mass of the people, Mohammedans. The capital, Mataram on the west coast, was bombarded in 1894 by a Dutch expedition, since when the island is administered by a Dutch resident. Pop. 370,000.

Lombroso, Cesare, Italian scientist: b. Verona 1836; d. Turin 1909. In 1862 he became professor of psychiatry at Pavia, and later of medical jurisprudence and psychiatry at Turin. He became widely known through his investigations of the abnormal human being, and through his theories deduced therefrom; theories which encountered great opposition and are not yet entirely accepted, but which formed in part the basis for the present criminal anthropology. He published numerous works, such as: 'The Criminal' (1887-95); 'The Man of Genius' (1890; Eng. trans. 1891); 'The Anarchists' (1895); 'The Causes of, and Contest against, Crime' (1902). Consult the study by Kurella (1892).

Lomond, Loch, lŏн lō-mŏnd, Scotland, a beautiful lake in the counties of Stirling and Dumbarton. Its length is about 24 miles; the breadth at the lower or southern end, 7 miles, at the upper end less than half a mile. For 14 miles from the head the breadth does not exceed 1½ miles. The lake is almost entirely surrounded with ranges of hills; and its surface is studded with numerous islands. The principal hills are on the eastern side, where a branch of the Grampians culminates in Ben Lomond, 3,192 feet high, on the very border of the lake. Through the glens intersecting the surrounding hills, the drainage of the district flows into the lake by the Falloch, Endrick, Fruin, Luss, and other streams; and the river Leven at the southwestern extremity conveys the overflow to the Clyde. The greatest depth is in the narrower part of the lake, where in some parts it reaches 600 feet. Fish, including salmon, salmon-trout, pike, perch, eels, and powans, usually called fresh-water herrings, are abundant. Steamboats in connection with the North British and the Caledonian Railway ply on the loch.

London, Jack, American author: b. San Francisco, Cal., 12 Jan. 1876. He was educated at the University of California, which he left to go to the Klondike region, and in 1892 went to sea before the mast. He has tramped throughout Canada and the United States for sociological study, and spent some time in seal fishing in 1893. He has published: 'The Son of the Wolf: Tales of the Far North' (1900); 'The God of his Fathers' (1901); 'A Daughter of the Snows' (1902); 'The Children of the Frost' (1902); 'The Cruise of the Dazzler' (1902); 'The People of the Abyss' (1903); 'Kempton-Wace Letters' (1903); 'The Call of the Wild' (1903); 'The Faith of Men' (1904); 'The Sea Wolf' (1904); 'The Game' (1905); 'Tales of the Fish Patrol' (1905); 'The Cruise of the Snark' (1911).

London, England, the largest city in the world, the capital of the United Kingdom of Great Britain and Ireland, and of the British Empire, situated on both banks of the Thames River, about 40 miles from its mouth, the latitude and longitude of Saint Paul's Cathedral being respectively 51° 30′ 48″ N. and 0° 5′ 48″ W. Modern London consists of the city of London as the nucleus, and the occupied surrounding parts of about 120 square miles taken from the counties of Middlesex, Surrey, and Kent. In 1855 the Metropolis Management Act was passed, defining for sanitary purposes, outside the nucleate city of London with 673 acres, 85 parishes, the whole, including the city, covering an area of 75,379 acres, 31,422 acres being the county of Middlesex, 23,893 acres in Surrey, and 20,064 acres in Kent. By the Local Government Act of 1888 this area was constituted the administrative county of London. In 1899, by the London Government Act of that year, the boundaries of the county were slightly altered, and the whole, with the exception of the city of London, was divided into 28 metropolitan boroughs, including the city of Westminster. The area of the administrative county is now 74,817 acres, including 31,652 acres formerly in Middlesex, 23,101 formerly in Surrey, and 20,064 formerly in Kent. See LONDON CITIES AND BOROUGHS.

The name London is therefore legally and properly applicable to the entire area within the county boundaries. But outside the county limits the urban aggregation extends, with numerous large and connected towns, to 15 miles around Charing Cross. These are embraced in the boundaries of the metropolitan and city police districts and constitute Greater London, bringing the total area to 443,419 acres with a population (1891) 5,633,806, (1901) 6,581,402, and notably in Essex this area is still extending; pop., 1910, estimated, 7,537,196.

Climate.—London is one of the healthiest of the large cities of Europe. The death rate per 1,000 living in 1841-50 was 24.8; 1851-60, 23.7; 1861-70, 24.4; 1871-80, 22.5; 1881-90, 20.5; 1891-1900, 19.1. The death rate for 1904 was 16.1 (or, including the deaths of Londoners in the metropolitan workhouses, hospitals, and lunatic asylums outside the county, 16.6), considerably lower than the rate (18.19) for all England and Wales. The mean annual temperature is about 50° and the general range of the thermometer is from 20° to 81°; the highest and lowest markings being, for the most part, in August and January respectively. The figures for 1904 were: average air temperature 49°.8; maximum (4 August) 91°; minimum (31 December) 17°.1 The prevailing wind is the southwest, and there are few places in the kingdom where less rain falls. In the beginning of winter London is occasionally enveloped in fogs, which are especially dense in the lower parts, and greatly aggravated by the perpetual pall of smoke-laden air overhanging the metropolis. This pall is occasioned by the general domestic and industrial use of bituminous coal. Even when this smoke-cloud does not take the unpleasant form of fogs it keeps the sunshine away to quite a considerable extent, in winter robbing London of fully half the sunshine it ought to enjoy, and giving to the metropolis that general gloom and begrimed aspect of buildings which are so depressing to visitors.

Table of the metropolitan boroughs, with their size in acres and population in 1891 and 1901:

BOROUGHS.	Area—acres.	Pop. 1891.	Pop. 1901.
North of the Thames.			
City of London	673	37,702	26,923
City of Westminster	2,503	201,969	183,011
Bethnal Green	759	129,123	129,680
Chelsea	660	72,954	73,842
Finsbury	589	109,981	101,463
Fulham	1,703	91,790	137,289
Hackney	3,289	199,606	219,272
Hammersmith	2,286	97,283	112,239
Hampstead	2,265	68,126	81,942
Holborn	405	66,781	59,405
Islington	3,091	319,155	334,991
Kensington	2,291	170,071	176,628
Paddington	1,356	135,055	143,976
Poplar	2,328	166,880	168,822
St. Marylebone	1,473	143,487	133,301
St. Pancras	2,694	235,345	235,317
Shoreditch	658	124,533	118,637
Stepney	1,766	285,116	298,600
Stoke Newington	863	47,988	51,247
South of the Thames.			
Battersea	2,160	150,166	168,907
Bermondsey	1,500	136,014	130,760
Camberwell	4,480	233,706	259,339
Deptford	1,563	101,770	110,398
Greenwich	3,852	78,493	95,770
Lambeth	4,070	278,393	301,895
Lewisham	7,014	88,933	127,495
Southwark	1,141	202,479	206,180
Wandsworth	9,130*	155,524	232,034
Woolwich	8,277	98,994	117,178
Total	74,839*	4,228,317	4,536,541

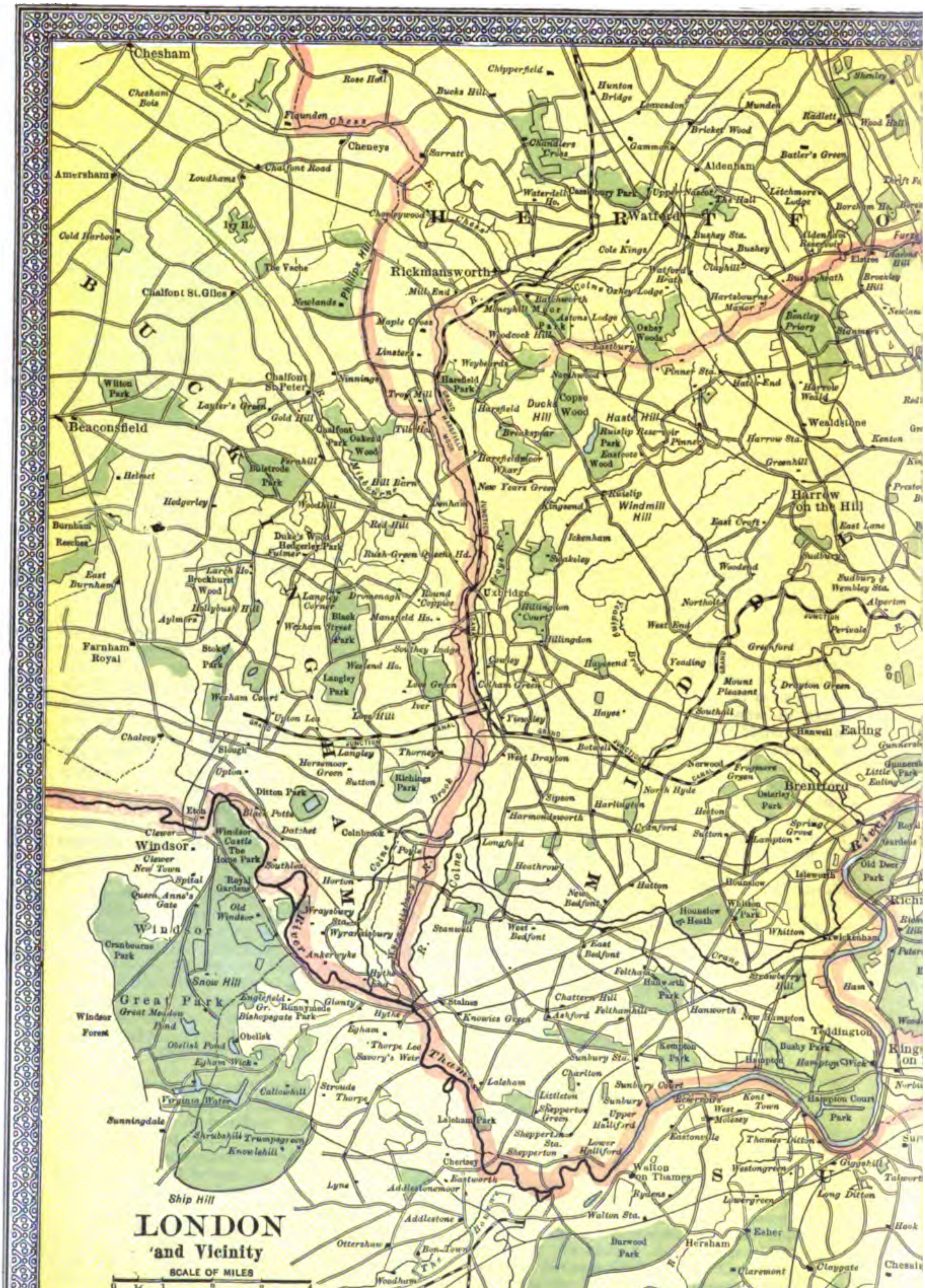
* Since 1901 an alteration of the county boundary has reduced the area of the borough of Wandsworth and of the county by 22 acres.

General Aspect, River, Bridges, Main Thoroughfares, etc.—London stands on alluvial deposits consisting of beds of clay and gravel, below which is the hard clay stratum known to geologists by the name of the «London clay,» in the middle of the great chalk basin extending from Berkshire to the east coast. On the north bank of the Thames, where the principal part of London stands, the site rises gradually at the rate of 36 feet per mile, while on the opposite bank the houses cover a nearly uniform and extensive flat, lying in some places several feet below the highest tides. Within the limits of London the Thames varies considerably in width. At Putney it is 550 feet, at Battersea 960, at Vauxhall 630, at Westminster 275 feet, at Waterloo 1,140 feet, while at Blackfriars it narrows down to 830 feet. At London Bridge, it is 800 feet wide, and at Woolwich 1,470 feet wide. The bridge farthest down the river is Tower Bridge, just below the Tower of London —a bascule bridge, which allows the passage of large vessels. London Bridge connects the city at King William Street with Southwark at the junction of Wellington Street and Tooley Street. About 500 yards further up the river stands Southwark Bridge, connecting the city and Southwark. About half a mile further west Blackfriars Bridge connects the city at Bridge Street with Southwark at Blackfriars road. Waterloo Bridge, nearly half a mile above the former, is a granite structure of 9 elliptical spans, and is 1,240 feet long between the abutments. It is perfectly level, and connects the Strand with the Waterloo road. Westminster Bridge crosses the river at the north end of the Houses of Parliament from Westminster to Lambeth. Further up the river Westminster and Lambeth are again connected by Lambeth and Vauxhall bridges. The Chelsea Suspension bridge connects Chelsea and Pimlico on the north side with Battersea to the west of Battersea Park; and the Battersea Bridge unites Chelsea and Battersea a little further west. Putney Bridge, a magnificent structure of granite, connects Fulham and Putney; and Hammersmith Bridge, the last in London, connects Hammersmith with Barnes. There are also six railway bridges across the Thames. One of them, at Charing Cross, displaced the old Hungerford Suspension Bridge, but is provided with a footway on one side. The two railway bridges at Pimlico, which look like one, belong to the London, Brighton, and South Coast Railway Company, and the London, Chatham, and Dover. The latter company owns a bridge close to Blackfriars Bridge. The new bridge at Vauxhall is said to be as notable a combination of art and utility as the famous Alexander III. bridge in Paris. The once famous Thames tunnel, two miles below London Bridge, opened in 1843 as a roadway under the river, now serves as a railway tunnel. A subway under the river, lined with iron hoops, connects Tower Hill and Tooley Street, Southwark, but is not opened to the public; and there is a great tunnel for foot-passengers and vehicles between Blackwell and East Greenwich and one for foot-passengers only between the Isle of Dogs and Greenwich. A tunnel for both vehicular and pedestrian traffic is in course of construction between Shadwell and Rotherhithe. Three underground electric railways pass under the river. There is a free steamboat ferry between North and South Woolwich.

Since the passing of the Metropolis Management Act of 1855 great changes have been made in the condition of London. The gigantic operations connected with the sewerage of London and the embankment of the Thames, from Blackfriars to Chelsea on the north side, and from Westminster Bridge to Vauxhall on the south, have produced great changes, while important lines of streets have opened up districts formerly almost inaccessible. These operations have also absorbed the former little rivers and rills, leaving only a corner, an alley, or a street—for example, Fleet Street—with their name for a monument. Further extensive main drainage works are being carried on which are estimated to cost £4,000,000, and extensive street improvements, sanctioned by Parliament, are in progress. In all the districts of London, and particularly in the City and West End, there has latterly been great improvement in the quality of architectural decoration and in public buildings, and stone has to a considerable extent replaced brick and plaster, though not so far as to change the aspect of some localities. Though some of the leading streets are wide, others are narrow and irregular. The decorative character of the streets about Lombard Street, and the Mansion House in the City, has been fostered by the growth of numerous banking and insurance companies, while the new office and store buildings in various quarters, especially the one opposite St. Mary-le-Strand, the hotels and apartment houses on the American steel structure plan, have added an entirely new style of brick architecture.

"The City"—the historic centre of London—is bounded south by the Thames; it extends north to Charterhouse Square, east to Middlesex Street, and west to the New Law Courts. Till 1878 this last boundary was marked by Temple Bar, an old gateway crossing Fleet Street near the Temple; but in that year this structure was removed, and a memorial was erected on the site. The portion of the City inside the area of the former mediæval walls is known as "London within the walls"; and all the wards are bounded by the site of the old walls; the portion outside extends irregularly all around and is known as "London without the walls."

Of the streets that run through modern London the most important from west to east is that which enters from Kew into Hammersmith, and passing through Kensington, forms the finest of all the approaches to London. It stretches on through Brompton, Knightsbridge, and Piccadilly, past fashionable Belgravia, with Kensington Gardens, Hyde Park, and Paddington on the north, and with Apsley House and numerous other palatial edifices facing the Green Park, which constitutes its south boundary for about half the length of Piccadilly. This line is broken at the east end of Piccadilly, but passes by Regent Street (or by the Haymarket) and Trafalgar Square into the Strand, which continues it farther east and much nearer the river, and it stretches on past the Temple, along Fleet Street, Ludgate Hill, St. Paul's Churchyard, where it runs into Cannon Street, leading to the Tower on one side, and on the other into Cheapside, Poultry, Lombard Street, Fenchurch Street, Aldgate, and by Whitechapel road, and Mile-end road through the congested poorer districts to the county boundary at Bow. The next great artery between the west and east extends along the Uxbridge road from Acton, entering the county boundary at Shepherd's Bush and passing through Notting Hill, along Oxford Street, through Holborn and Newgate Street, where it joins the more south line above described, at the west end of Cheapside. Farther north is a third line, extending from near Kensington Gardens, through Oxford and Cambridge Terrace along the Marylebone, Euston, Pentonville road, to Islington, and thence by the City road



LONDON

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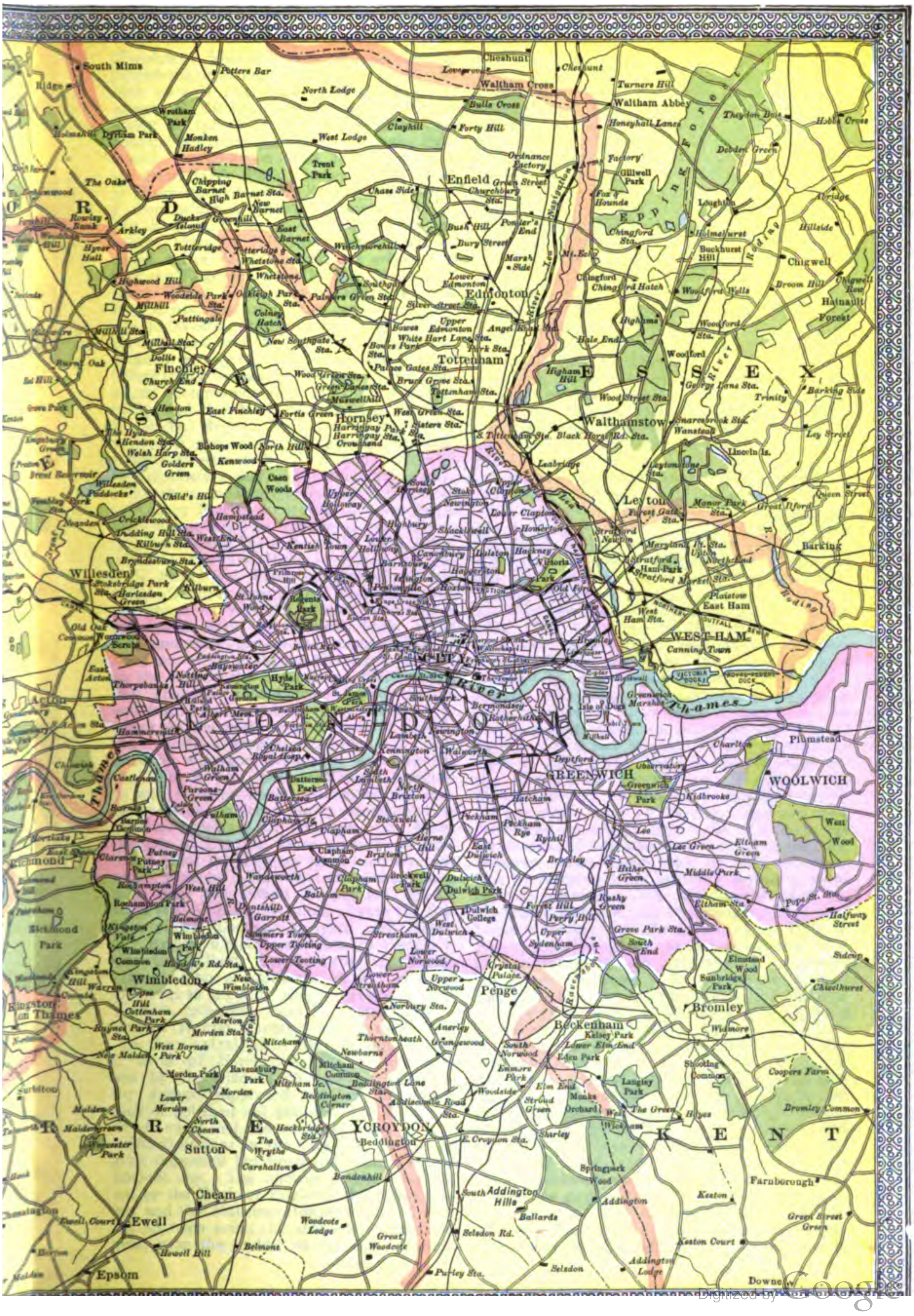

South Mims
Potters Bar
North Lodge
Cheshunt
Waltham Cross
Turners Hill
Waltham Abbey
Bulls Cross
Wrotham Park
Dyrham Park
Monken Hadley
West Lodge
Clayhill
Forty Hill
Theydon Bois
Epping Forest
Trent Park
Enfield
Ordnance Factory
Gilwell Park
The Oaks
Chipping Barnet
High Barnet Sta.
New Barnet
East Barnet
Chase Side
Loughton
Arkley
Totteridge
Whetstone
Bush Hill
Ponder's End
Bury Street
Chingford Sta.
Chigwell
Highwood Hill
Millhill
Woodside Park Sta.
Colney Hatch
Southgate
Palmers Green Sta.
Lower Edmonton
Edmonton
Chingford
Woodford Wells
Hainault Forest
New Southgate Sta.
Bowes Park
Upper Edmonton
Angel Road Sta.
Finchley
Church End
Tottenham
Woodford
Hendon
Hornsey
Wood Green Sta.
Muswellhill
Higham Hill
E S S E X
East Finchley
Fortis Green
Walthamstow
Wanstead
Barking Side
The Hyde
Hendon Sta.
Welsh Harp Sta.
Golders Green
Kenwood
Bishops Wood
North Hill
Crouchend
Leabridge
Caen Woods
Child's Hill
Hampstead
Stamford Hill
Stoke Newington
Upper Clapton
Lower Clapton
Leyton
Forest Gate Sta.
Manor Park Sta.
Great Ilford
Cricklewood
Kilburn Sta.
West End
Kentish Town
Highbury
Hackney
Homerton
Stratford
Barking
Willesden
Harlesden Green
Kilburn
St. Johns Wood
Regents Park
Islington
Pentonville
Canonbury
Victoria Park
Old Ford
Plaistow
East Ham
West Ham Sta.
WEST-HAM
Canning Town
Old Oak Common
Wormwood Scrubs
Notting Hill
Bayswater
Hyde Park
CITY
Poplar
Blackwall
Victoria Docks
Royal Albert Dock
East Acton
Acton
Hammersmith
L O N D O N
Southwark
Bermondsey
Rotherhithe
Isle of Dogs
Millwall
River Thames
Greenwich Marshes
Plumstead
Charlton
Chiswick
Chelsea
Walworth
Lambeth
Kennington
Newington
Deptford
GREENWICH
Observatory
Greenwich Park
WOOLWICH
Castlenau
Walham Green
Parsons Green
Fulham
Battersea Park
Battersea
South Lambeth
North Brixton
Stockwell
Hatcham
Kidbrooke
Barnes
Mortlake
Clapham
Peckham
Peckham Rye
Lee
Richmond
Putney
Clapham Common
Brixton
Herne Hill
East Dulwich
Brockley
Lee Green
Eltham Green
West Wood
Roehampton
Wandsworth
Balham
Clapham Park
Brockwell Park
Dulwich
Dulwich Park
Hither Green
Middle Park
Richmond Park
Kingston Vale
Wimbledon Park
Earlsfield
Garratt
Dulwich College
Forest Hill
Perry Hill
Rushy Green
Eltham Sta.
Wimbledon Common
Summers Town
Upper Tooting
Lower Tooting
Streatham
West Dulwich
Upper Sydenham
Grove Park Sta.
South End
Sidcup
Kingston Hill
Wimbledon
New Wimbledon
Lower Norwood
Upper Norwood
Crystal Palace
Penge
Elmstead Wood
Sunbridge Park
Chislehurst
Kingston on Thames
Cottenham Park
Merton
Morden Sta.
Norbury Sta.
Thorntonheath
Anerley
Beckenham
Kelsey Park
Lower Elm End
Bromley
Widmore
West Barnes Park
Mitcham
Newbarns
South Norwood
Eden Park
Shooting Common
Coopers Farm
Surbiton
Morden Park
Ravensbury Park
Mitcham Common
Beddington Lane Sta.
Addiscombe Road Sta.
Woodside
Elm End
Langley Park
Bromley Common
Lower Morden
Morden
Beddington Corner
Stroud Green
Monks Orchard
The Green
Hayes
West Wickham
Malden
North Cheam
Hackbridge Sta.
CROYDON
Beddington
E. Croydon Sta.
Shirley
R R E Y
K E N T
Worcester Park
Sutton
The Wrythe
Carshalton
Springpark Wood
Farnborough
Bandonhill
Cheam
South Addington Hills
Addington
Keston
Ewell
Ewell Court
Woodcote Lodge
Ballards
Great Woodcote
Selsdon Rd.
Green Street Green
Keston Court
Howell Hill
Belmont
Epsom
Purley Sta.
Selsdon
Addington Lodge
Downe

to Finsbury Square. Among the leading thoroughfares running north and south the extreme west is Edgeware road, which enters the county at Kilburn, terminating at its south extremity in Oxford Street, from which it runs northwest, but communicating through Park lane with Piccadilly, a little to the west of which, from Hyde Park Corner Place, Grosvenor Place leads down to Buckingham Palace road, from which Vauxhall road forms a connecting line with the river. Park lane and Grosvenor Place on this line contain many of the most select residences of the aristocracy. East of the Edgeware road Regent Street with Portland Place, Tottenham Court road with Charing Cross road, and other connecting lines leading to Westminster, Pimlico, and Chelsea, Gray's Inn road, and the line of Chancery lane, Farringdon Street, etc., leading to Fleet Street and Blackfriars Bridge, form some of the most important communications in this direction. Piccadilly and Pall Mall, running east and west, Bond Street, Regent Street, and St. James' Street, north and south, are among the most fashionable streets in the West End, each with its own distinctive character. Bond Street contains the shops most patronized by the aristocracy; Regent Street, according to some tastes the handsomest street in London, is the fashionable promenade and has some of the finest shops. It unites by Portland Place in the north with Regent's Park and Primrose Hill Park, and intersects Oxford Street and Piccadilly, and reaches south to Waterloo Place, by which it communicates with St. James' Park. The greatest and most picturesque thoroughfare in London, not of an exclusive mercantile character, is the line of the Strand and Fleet Street.

The Thames Embankments belong to the modern features of London. The Victoria Embankment on the north side consists of a wide roadway, with a granite retaining wall, surmounted by a parapet broken by pedestals for lamps. There are well contrived landing-stages and recesses, these features of the Embankment being rendered highly ornamental by balustrades, pedestals for sculpture, etc. From the Temple to Charing Cross portions of land reclaimed from the Thames have been laid out in public gardens. The Chelsea Embankment extends from the Albert Suspension Bridge eastward past Chelsea Hospital. From the fine building of St. Thomas' Hospital next Westminster Bridge, on the south side of the river, extends the Albert Embankment, continuous with the old quay at Lambeth. A very valuable improvement in the City was the Holborn Valley Viaduct, extending from Newgate Street to the end of Hatton Garden. Broad roads also lead to the Central Meat Market, and to the lower level of Farringdon Street, which is crossed by the viaduct obliquely, with three Gothic arches supported on 12 hexagonal columns of polished red granite. The estimated length of streets in London is over 2,000 miles.

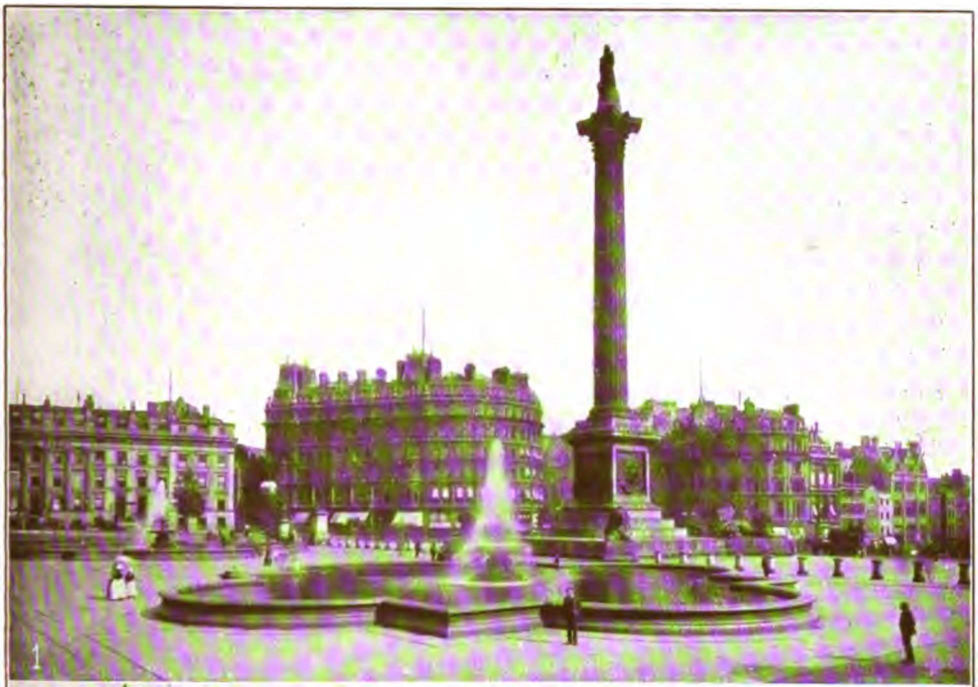
Public Buildings in the City.—A number of the most important buildings are situated within the ancient city. The nucleus of the whole is formed by the Bank of England, the Royal Exchange, and the Mansion House, which all face toward an open area; the centre of bustle and business, near the middle of the city, adorned with the handsome offices of several assurance companies. The Bank of England, in Threadneedle Street, was built in 1732-4 and now forms a low flat, insulated, irregular parallelogram covering four acres of ground. The Royal Exchange is an extensive and ornate building, having a portico surmounted by a pediment enriched by sculpture. It surrounds an open interior quadrangle, in the centre of which is a marble statue of Queen Victoria. In this court, which is surrounded by covered arcades, the meetings of the merchants on Change are held. An equestrian statue by Chantrey of the Duke of Wellington occupies the area in front of the building. The Royal Exchange, originally founded by Sir Thomas Gresham in 1566, was burned down in 1666, rebuilt, and again burned down in 1838, the present edifice being erected on its site. The exchanges for special purposes are: The Stock Exchange in Capel Court; the Coal Exchange, Lower Thames Street, a sumptuous though rather incongruous building, the great hall of which is circular, 60 feet in diameter, and 74 feet to the apex of the glazed dome; the Corn Exchange, in Mark Lane, opened in 1747, enlarged and partly rebuilt in 1827, and now again almost entirely rebuilt. The Mansion House, the official residence of the lord-mayor, was built in 1739-53. The Guildhall, at the north end of King Street, Cheapside, is where the principal business of the corporation of the city of London is conducted. The civic banquets are given here. A splendid new council chamber was completed in 1885. The hall itself is now covered with a decorative open timber roof of the Perpendicular Gothic style; the old front has been replaced by a new Gothic front. The hall is capable of seating 3,000 persons, and contains some monuments of ordinary sculpture; and at the west end, raised on pedestals, are colossal figures of Gog and Magog. In 1872 a handsome suite of rooms was added to the Guildhall for the Corporation Library and Museum. The library consists of upward of 40,000 volumes. Of late years some of the city companies have remodeled or rebuilt their halls. Of these the Clothworkers' Company have produced the most elaborate street façade, but its confined situation in Mincing Lane does not permit it to be seen to advantage. The Goldsmiths' Hall behind the post-office; the Fishmongers' Hall near London Bridge; and the Ironmongers' Hall, in Fenchurch Street, are the principal structures. In the city many old and familiar landmarks have been removed. The once famous East India House in Leadenhall Street, and the Excise Office in Broad Street, have been replaced by immense piles of offices; Doctors' Commons has been cleared away for the new street to the Mansion House; Sir C. Wren's College of Physicians is supplanted by meaner buildings; the site of the Steel-yard, memorable in the history of old London, is absorbed by the city terminus of the South Eastern railway; old churches have been leveled, and old inns, hostelries, and streets, replete with great historic and literary associations, have disappeared; while outside the city a whole region full of good and bad memories has been cleared away for the new Law Courts; the Statepaper Office is displaced by the Foreign Office; Tattersall's is crossed by streets; chambers occupy the ground of the Old Thatched House; and a gymnasium has supplanted the British Institution.

The Tower.—This celebrated fortress, which formed the dominating feature of Norman London, stands on the north bank of the Thames, immediately adjoining the boundary of the city. Besides its use as a fortress the Tower was the temporary residence of several kings and queens of England, but is now only used as a storage for armor and as headquarters for certain military matters. It occupies an area of 12 acres, enclosed within a wall surrounded by a ditch, now dry, and laid out as a garden. On the south side is an archway called the «Traitors' Gate,» through which state prisoners were brought from the river. The whole region of the Tower abounds with reminiscences of English history, conjured up by such names as Raleigh, Algernon Sidney, Anne Boleyn, Catherine Howard, etc. The most ancient part is the keep, now known as the White Tower, which was erected about 1078 for William the Conqueror by Fundulph, bishop of Rochester. It stands near the centre of the quadrangle, around which are placed several other towers, each having its distinctive name. The Tower contains the Wellington Barracks, erected on the site of the grand storehouse, burned down in 1841; the jewel room, a modern edifice, in which are preserved the regalia of Great Britain; the horse armory, Queen Elizabeth's armory, and the Church of St. Peter-ad-Vincula.

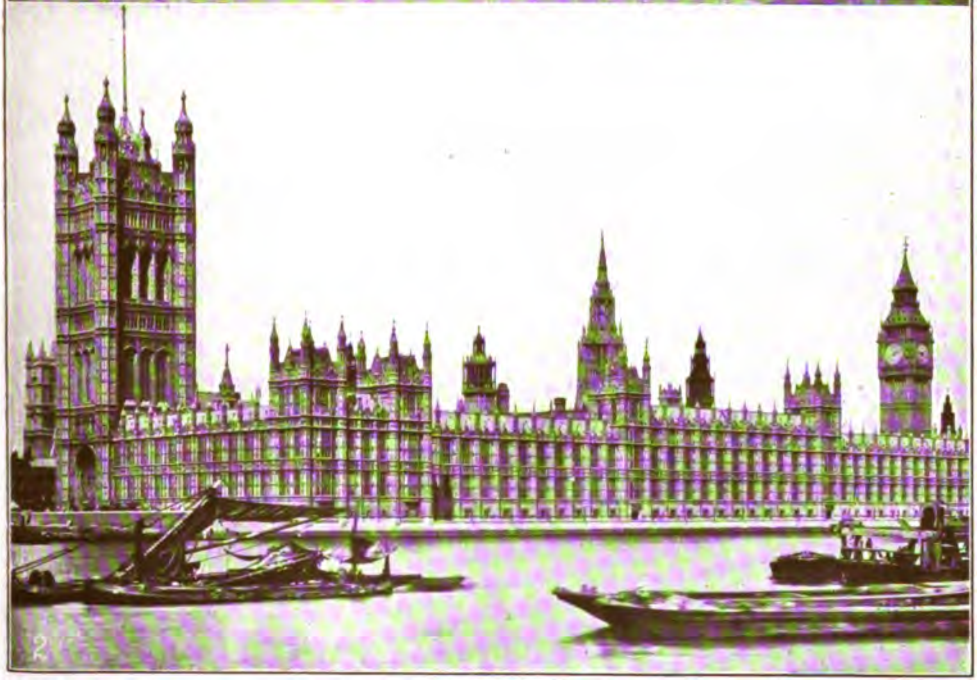
Church Buildings.—Saint Paul's Cathedral stands on the summit of Ludgate Hill, on a site which was formerly used for pagan worship, and has been occupied by a church from early Saxon times. Old Saint Paul's, a vast Gothic building, was destroyed by the great fire of 1666, and only a few columns of the chapter house now remain to view. The present church, on the same site, the greatest and most conspicuous architectural ornament of London, planned and carried out by Sir Christopher Wren, was begun in 1675, and completed in 1710. It is 510 feet in length from east to west, while the transept is 250 feet long, exclusive of the semicircular portico at each end; the breadth of the west front is 180 feet, and the height of the walls 110 feet. The building is crowned with an immense dome, surmounted by a lantern with ball and cross, the height of the latter being 404 feet from the ground. It is built of Portland stone, and cost £747,954, which was paid by levying a tax on coal. The interior has been decorated at great cost by voluntary means, according to the original intentions of Wren. Among the monuments it contains are those of Wellington, Nelson, Sir Ralph Abercromby, Sir John Moore, Dr. Johnson, Howard, Sir Joshua Reynolds, and eminent men of more modern times. Near together, under the centre of the dome, lie interred Lord Nelson and the Duke of Wellington. Westminster Abbey, one of the finest specimens of the Pointed style in Great Britain, dates from the reign of Henry III., and Edward I., when it was erected on the site of the Saxon minster founded by Sebert. The beautiful chapel at the east end was added by Henry VII., and at the beginning of the 18th century the upper parts of the two towers at the west end were erected from designs of Sir Christopher Wren. It is 360 feet long, and 195 feet wide, within the walls. Here kings and queens have been crowned, from Edward the Confessor to Edward VII., and here many of them are buried, some with and others without monuments. In the south transept are the tombs and honorary monuments of great poets, from Chaucer down to Tennyson, whence it is called «Poets' Corner,» and in other parts are numerous sculptured monuments to statesmen, warriors, philosophers, divines, patriots, and eminent individuals generally, many of whom are interred within its walls. Of the other sacred edifices in London the most remarkable are: Saint Bartholomew's in West Smithfield, which consists of the chancel and lady-chapel only of the original church, and contains some beautiful specimens of Norman, Early English, and later styles of architecture; Saint Saviour's in Southwark, now a cathedral, boasts of the best Early English architecture in London in its choir and lady-chapel, the principal portions of the old church which remain; Saint Giles, Cripplegate, a beautiful pre-Reformation church; Saint Stephen's, Walbrook, the interior of which is extremely fine and generally regarded as one of Wren's best works; and the Temple Church, which is one of the very few round churches now remaining in England, and combines transition Norman architecture with Early English, the latter in the choir, which was founded in 1240. Besides these there are very few of the older churches left, among the most interesting of which is Bow Church. Of the remainder, Wren's churches are very beautiful, and perhaps Saint Bride's in Fleet Street, and Saint Martin's-in-the-Fields, may also be specified. During the Georgian period hideous specimens of architecture were erected, and these still predominate. Among Roman Catholic churches in London are Saint George's Cathedral, in Southwark, finished in 1848, and the magnificent new cathedral of Byzantine architecture at Westminster, with an imposing campanile 300 feet high. The largest arch over any known church doorway admits 10,000 worshippers to ample accommodation under a central dome 120 feet high. The plan dispenses with stained-glass windows,—a wise arrangement in dark London. Twenty-nine marble columns support aisles, galleries, and arches of transepts, with bases of Norwegian granite and capitals of white Carrara elaborately carved. Many of the Nonconformist churches are handsome structures. Among the finest of them are the City Temple on the Viaduct, opened in 1874; Christ-church in Westminster Bridge road; the Apostolic (or Irvingite) church in Gordon Square; and the Tabernacle, Newington Butts; while the site of the former Royal Aquarium at Westminster is to be occupied by a mammoth connectional building, built by the Wesleyan Methodists.

The Houses of Parliament.—These consist of the House of Peers and the House of Commons, with the connected apartments and offices, the whole practically forming one structure. It is a highly decorated structure in the Tudor Gothic style, after designs by Sir Charles Barry. It stands on the left bank of the Thames, between the river and Westminster Abbey, and extends over an area of about 8

LONDON.



1. Trafalgar Square.



2. Houses of Parliament.

acres. The façade which overlooks the river is 900 feet in length. The walls are of brick, faced externally with magnesian limestone, and the whole edifice is separted from the river by a terrace of Aberdeen granite. It is paneled with rich tracery, and profusely decorated with statues and shields of arms of the kings and queens of England from the Conquest to the present time. In the southwest angle is the Victoria Tower, supported on four pointed arches 60 feet in height; it is 75 feet square and 340 feet in height. There is also a tower in the centre, 300 feet high by 60 feet, surmounted by a lantern; and the clock tower, at the north end of the edifice, with its richly decorated spire, rises 320 feet. The House of Peers is an apartment 97 feet long, 54 feet wide, and 45 feet high; magnificently decorated throughout with carved oak paneling, a profusion of gilding, paintings in fresco, and richly stained glass windows. The House of Commons is a somewhat smaller apartment, fitted up in a much plainer style. Paintings in fresco and the water-glass medium, and statues of great statesmen have been added to the internal decorations; and a statue of the architect has been placed on the staircase leading up to the committee rooms. Westminster Hall, the most magnificent hall in the kingdom, 290 feet long, was built by William Rufus and improved by Richard II. The hall is not now used except as a members' entrance to the House of Commons.

Palaces.—Saint James', erected by Henry VIII., from a design by Holbein, at the foot of Saint James' Street, is an irregular and picturesque brick building. It is well adapted internally for royal levees and drawing rooms, which are held here during the fashionable season. Buckingham Palace, facing the west end of Saint James' Park, was built by George IV., and consists, since the erection of the east front, of a quadrangular range of buildings. In the gallery, which is 160 feet long, are some good pictures. The king resides here occasionally in the spring and summer. Whitehall—the Banqueting House—designed by Inigo Jones in the Paladian style, is the only remnant of the ancient palace of Whitehall; the ceiling, painted by Rubens, is the most extensive work of that artist existing in the country. Kensington Palace, in Kensington Gardens, is a brick building of the Jacobean period, and was thrown open to the public by Queen Victoria shortly before her death. It was the birthright of Her Majesty. Lambeth Palace on the Surrey side of the river, opposite the Houses of Parliament, has been for many centuries the residence of the archbishops of Canterbury. It is a brick edifice, and comprises a great variety of styles in architecture, from Early English downward, and contains a library of 30,000 volumes. Fulham Palace, the residence of the bishops of London, is a building of no architectural pretension. It is pleasantly situated on the Thames, and at one time had extensive and well-timbered grounds. Greenwich Palace, once the home of the Tudor and Stuart sovereigns, is a stone building of considerable beauty, now used as a training school for the navy. Eltham Palace, once a residence of Henry VIII., is now a picturesque and well-preserved ruin.

Government Offices.—These are mostly situated in and near Whitehall. The Treasury, Home Office, and Education Department occupy one range of buildings, which have been improved by a uniform and handsome façade. The India Office and the Local Government Board face Saint James' Park. The Horse Guards, which are somewhat nearer Charing Cross, have little to admire in their external appearance, but opposite, and next to the Banquet Hall of the old Whitehall Palace, from the window of which Charles I. stepped to his execution, rises the New War Office, and farther on the New Admiralty Office. An extensive pile of government offices, for the Foreign Office and the Colonial Office, has been erected in Downing Street. The style is Italian and the building exhibits a large amount of decorative detail, part of it in red and other colored marbles and granites. Some of the public offices are in Somerset House, once a royal palace of Charles II. It has a spacious and handsome quadrangle, finished in 1782, from designs by Sir W. Chambers; its north façade, 200 feet in length, faces the Strand; and its south front, 800 feet long, overlooks the river. The Post-Office, near Saint Paul's, is a spacious and handsome building. It is 390 feet long, 130 feet wide, and 64 feet high. Its façade, which is toward Saint Martin's-le-Grand, has three Ionic porticoes. A supplemental building for telegraph and other business occupies the opposite side of Saint Martin's-le-Grand. The Mint, a stone building of the ordinary Georgian architecture, finished in 1810, stands on Tower Hill, and occupies about 10,000 square yards. The royal arsenal and dockyard for military stores is at Woolwich.

Courts of Law.—London is the seat of the supreme courts of the kingdom. Several of these were long accommodated at Westminster Hall, but in 1883 were removed to the New Law Courts at the junction of the Strand and Fleet Street. This great building occupies an area of nearly four acres. It is of a somewhat heavy mediæval character, a large western tower being its chief feature. The Old Bailey, adjoining the famous Newgate Prison, has, with the latter, been demolished to make way for the palatial Sessions House of the City of London. It is the central criminal court for the trial of prisoners who have committed serious offenses in the metropolitan district. One or more of the judges of the law courts sit here also in the old court, while the new court is presided over by the recorder and common sergeant of the City of London. There are numerous county courts within London for the trial of small debt cases. Besides the above there are also the Clerkenwell Session House; the city police courts, which are held at the Mansion House and Guildhall, and are presided over by the lord-mayor and one of the aldermen; and numerous police courts, each of which is presided over by a barrister of at least seven years' standing. The Inns of Court, as they are called, are four, the Inner Temple, Middle Temple, Lincoln's Inn, and Gray's Inn. Every law student, before he can be called to the bar, has to be entered as a member of one of these inns, and to dine a certain number of times in the common hall. The Inner and Middle Temple are close to Temple Bar, between Fleet Street and the river. The roof of Middle Temple Hall, built in 1572, is considered the best specimen of Elizabethan architecture in London. Lincoln's Inn is situated between Chancery Lane and the extensive square called Lincoln's Inn Fields, now open as a public garden. A handsome hall and library in the Tudor style, from the designs of Hardwick, have been erected in the gardens. Gray's Inn stands on the north side of Holborn. The other «Inns,» Staple Inn, New Inn, Sergeant's Inn, are now in private hands and not connected with the law.

Clubs.—Many of these establishments, having most elaborate and ornate buildings, are among the principal architectural features of West London. They are situated chiefly in and near Pall Mall and vie with each other in elegance and luxury. The principal are: the Athenæum, possessed of a fine library, and having a great many artists and men of science and letters among its members; the Army and Navy, the United Service, the Guards', and the Junior United Service; the Carlton, the great Tory Club, standing side by side with the Reform Club in Pall Mall, the former numbering 1,800 and the latter 1,400 members; the Junior Carlton; the Oriental; the Travelers'; Brooks, one of the oldest of the clubs; White's, a still older club, much frequented by the Conservative nobility; the Conservative; the Devonshire; the Oxford and Cambridge; the Garrick, frequented by lovers of the drama; and four political clubs, which have the largest numbers of members, the Constitutional having 6,500, the National Liberal 7,000, the Junior Conservative 5,500, and the Junior Constitutional 5,000.

Hotels.—The Grand Hotel, Trafalgar Square, occupying part of the site of old Northumberland House; the Victoria Hotel and Hotel Metropole in Northumberland Avenue; the Hotel Cecil in the Strand; the Savoy Hotel on the Embankment; the Carlton Hotel at the corner of the Haymarket; the Russell Hotel, occupying the greater part of the east side of Russell Square, recently built; and De Keyser's immense hotel at Blackfriars, are the most important and attractive. There are large hotels at Charing Cross and Cannon Street in connection with the South Eastern railway, at St. Pancras in connection with the Midland railway, the last named being the largest and one of the handsomest in London; and at Marylebone in connection with the Great Central railway. Also associated with railways are the Great Western Hotel at Paddington; the Great Northern Hotel in King's Cross; the Grosvenor Hotel at Pimlico. Other large hotels are the Langham Hotel, Portland Place; the Westminster Palace Hotel in Victoria Street; the Salisbury Hotel, in Salisbury Square, Fleet Street; the First Avenue near Gray's Inn; and the famous Ship Hotel at Greenwich.

Theatres, Public Halls, etc.—The principal theatres are Covent Garden (the Royal Opera House), opened in 1858; His Majesty's, the historic Drury Lane, the Haymarket, the Strand, the Adelphi, the Surrey, the Gaiety (recently demolished and rebuilt), the Vaudeville, Saint James', the Savoy, the Avenue, the Comedy, Criterion, Terry's, the Lyric, the Garrick, the Shaftesbury, the Duke of York, the Prince of Wales, Wyndham's, and the Court. There are also many new erections, whose names are not so familiar as those just named. Local theatres have been built in many of the outlying parts of London. Saint James' Hall, remarkable almost entirely for its interior and chiefly devoted to musical entertainments of a high class, has recently been demolished. The Queen's Hall in Portland Place, and the Albert Hall at Kensington, are devoted to high-class music. Hanover Square Rooms were once famous as concert rooms. Exeter Hall, in the Strand, is occupied by the Young Men's Christian Association, and is used also for the annual May meetings of the different religious societies. The Freemasons' Hall in Great Queen Street, is well known, and Olympia, at West Kensington, is a large and imposing hall in an extensive area. The Congregational Memorial Hall, and the Agricultural Hall, Islington, the largest covered area in London, are also important buildings of this kind. The Empire and the Alhambra in Leicester Square are the chief of numerous music halls in London.

Markets.—These are numerous, but have generally little to attract either in external beauty or in internal arrangement. The principal ones are: Billingsgate for fish; the Borough Market, Southwark, and the famous Covent Garden for vegetables, fruit, flowers, and plants; Leadenhall for poultry, game, etc.; Deptford for foreign cattle; Smithfield for fresh meat, poultry, and fish; the Islington cattle market, in the Caledonian road. The Spitalfields market and the Woolwich market, for vegetable products, are included in the public markets. But London is inadequately provided. The city corporation owns all the largest markets, and exercises charter rights to prevent others being erected. The result is that all retail markets are in the hands of costermongers.

Museums, Galleries, Libraries.—The British Museum (q.v.), founded in 1753, in Great Russell Street, is a spacious and imposing edifice, with a classical façade and sculpture in the pediment, built between 1823 and 1857. It contains an immense collection of books, manuscripts, engravings, drawings, sculptures, coins, minerals, stuffed animals, fossils, preserved plants, etc., and a magnificent collection of ethnographical objects, Egyptian, Assyrian, Etruscan, Greek, and other antiquities. An extensive building (about 650 feet long) has been erected in the South Kensington quarter for the accommodation of the natural history collections. The museum of the Royal College of Surgeons, on the south side of Lincoln's Inn Fields, a rather handsome building, contains a magnificent collection of human skulls from all parts of the world, and many curious surgical preparations. The Sloane Museum, on the north side of Lincoln's Inn Fields, possesses many valuable objects, consisting of books, paintings, prints, MSS., drawings, maps, models, plans, etc. The Dulwich College gallery contains many interesting pictures left by Alleyne, a contemporary actor of Shakespeare's age. The great South Kensington or Victoria and Albert Museum contains most valuable collections, carefully arranged for purposes of instruction, in connection with which are the Schools and headquarters of the Department of Science and Art. Museums have also been established at Bethnal Green and in South and

North London, and quite recently Hertford House, with its priceless art treasures, the gift of Sir Richard Wallace, and the Horniman Museum at Forest Hill, the gift of the late Mr. F. J. Horniman, have been added to the London museums. The chief picture gallery in London is the National Gallery, on the north side of Trafalgar Square. It contains about 1,200 paintings, acquired partly from donations, partly by purchase. The National Portrait Gallery is a collection of over 1,100 portraits, busts, and medallions, brought together since 1858. For this collection a new building beside the National Gallery has been provided by private munificence; and the Tate Gallery of British Art, on the Thames Embankment, has been similarly acquired. The Royal Albert Hall of Arts and Sciences, a memorial to the late prince consort, is a huge building between the Horticultural Gardens and Kensington road. It was erected for the purposes of science and art, musical performances, exhibitions, etc. It is chiefly used for concerts and is capable of accommodating an audience of 8,000, while the orchestra itself accommodates 1,000 performers. The building also contains a picture gallery. In Hyde Park, immediately opposite this building, is the Albert Memorial. The north wing of Burlington House, Piccadilly, has been granted to the Royal Academy and a suite of rooms built in the rear of it for exhibitions. The east and west wings of Burlington House are occupied by various learned societies, the Royal Society, the Society of Antiquaries, and others. Near the South Kensington Museum and the Albert Hall is the splendid block of buildings of the Imperial Institute, with its various permanent collections, and exhibitions, and institutions. Besides the British Museum library the chief libraries are Lambeth Palace library, the Guildhall library, Sion College library, the London library (subscription), London Institute library, and in addition large circulating libraries and many free public libraries supported by taxes.

Educational Institutions.—At the head of these stands the London University (q.v.), which promises to become the foremost scientific university in the kingdom. Other institutions are denominational colleges for theology (in some combined with general education), the Royal Naval College, Greenwich; the Royal Military Academy, Woolwich; the Royal College of Science; the medical schools attached to the hospitals; Royal Academy of Music; Royal College of Music; Trinity College, chiefly for music; several colleges for ladies, etc. Among the grammar and secondary schools are Saint Paul's School, founded in 1509, which provides a free education for 153 boys, with scholarships to Oxford and Cambridge; the Merchant Taylors'; Westminster School, founded by Queen Elizabeth in 1560; University College School, King's College School, City of London School, Mercers' School, and schools of the several other city companies. Besides the above and numberless private schools, there are the City and guild institutions for technical education, many high schools for girls, many free schools, numerous schools of the National Society, and more than 500 schools of the London county council. Several polytechnics and centres of technical education have been equipped and supported by the London county council, who have also established a system of county scholarships for students.

Scientific Associations, etc.—Associations for promoting science, art, learning, etc., are exceedingly numerous. The chief are the Royal Society, Burlington House, founded in 1660; the Society of Antiquaries, in the same building, originally founded in 1572; the Royal Academy (of painting, etc.), in Trafalgar Square, founded in 1768; the Royal College of Physicians, founded by Linacre, physician to Henry VIII., in 1518; the Royal College of Surgeons; the Royal Geographical Society, with a choice geographical library and large collection of maps; the Institution of Civil Engineers; the Royal Institute of British Architects, possessing a good library of architectural works; the Royal Institution of Great Britain, established in 1799; the Royal Horticultural Society, which possesses the botanic gardens in Regent's Park, as also at South Kensington and at Chiswick; the Royal Astronomical Society; the Royal Asiatic Society; the British Association; the Zoological Society, with its collection of animals in Regent's Park; the Geological Society, and the Anthropological Institute.

Hospitals and Charitable Institutions.—Besides the three great endowed hospitals: Saint Bartholomew's, in West Smithfield; Guy's, Southwark; and Saint Thomas, Lambeth, occupying a large and splendid range of buildings on the Thames Embankment opposite the Houses of Parliament; there are the London Hospital, Saint George's Hospital, the Middlesex Hospital, Westminster Hospital, Charing Cross Hospital, King's College Hospital, University College Hospital, Saint Mary's Hospital, and Royal Free Hospital, all with medical schools attached. Other general hospitals are: The Great Northern Hospital, the West London Hospital, and the Metropolitan Hospital; besides the German Hospital, Dalston; hospitals for special diseases, as consumption, fever, cancer; hospitals for women, for children, etc. Bethlehem Hospital (Bedlam), in Saint George's Fields, south of the river, is the chief hospital for lunatics; Saint Luke's Hospital is also for insane patients. The Foundling Hospital (see FOUNDLING) is rather an asylum for illegitimate children generally than a hospital for foundlings. Chelsea Hospital and Greenwich Hospital are institutions by themselves.

Prisons.—There are altogether about a dozen criminal prisons. The most celebrated of these, Newgate, near Saint Sepulchre's Church, a gloomy and massive structure, the scene of a great many executions, was pulled down in 1903. Millbank penitentiary, or prison, an immense brick edifice with external walls enclosing upward of 16 acres has been demolished, and the site utilized partly for workmen's dwellings, and partly for the Tate picture gallery. The chief existing prisons are the Wandsworth prison, Holloway prison (for females); the model prison, Pentonville, containing 1,000 cells, in which the inmates are taught useful trades; Wormwood Scrubs prison, a large building standing on the borders of London.

Squares and Public Monuments.—The squares of London are characteristic; many of them are of great beauty and extent, and planted with shrubbery. Among them are: Saint James' Square, north of Pall Mall; Eaton, Belgrave (10 acres), Grosvenor, Portman, Cavendish Squares, all in the West End; Russell Square (10 acres), Bedford, Bloomsbury, Tavistock, and Euston Squares, in the west central part of the town; Trafalgar Square, at Charing Cross, fronting one of the principal thoroughfares, and adorned with public buildings, fountains, the Nelson Column, and statues of Charles I., George IV., and others. The most conspicuous public monuments are: «the Monument» on Fish Street Hill, London Bridge, a fluted Doric column, 202 feet high, erected in 1677, in commemoration of the great fire of London; the York Column, at the south end of Waterloo Place, a plain Doric pillar of granite, 124 feet high, surmounted by a bronze statue of the Duke of York; a fluted Corinthian column in Trafalgar Square, 176½ feet high, raised in honor of Nelson, and surmounted with a colossal bronze statue of the hero, having the pedestal decorated with bronze sculptures in high relief, and four magnificent lions, by Sir E. Landseer, at the angles; the Albert Memorial, Hyde Park, the most splendid and costly monument of recent times, being a Gothic structure, 176 feet high, with a colossal seated statue of the prince under a magnificent canopy elaborately sculptured and adorned; and the projected magnificent memorial to Queen Victoria with its beautiful surroundings in front of Buckingham Palace. There is a statue of the Duke of Wellington in front of the Exchange, and a statue of Sir Robert Peel at the top of Cheapside. Statues of Sir Charles J. Napier, Sir Henry Havelock, and General Gordon stand in Trafalgar Square. On the Thames Embankment, not far from the Temple, now stands the Egyptian obelisk known as Cleopatra's Needle; and west of it are statues of Robert Raikes, the founder of Sunday schools, General Outram, John Stuart Mill, and others. In Waterloo Place is a memorial to the Guards who fell in the Crimea, and here is also a statue of Sir John Franklin. An equestrian statue of the Duke of Wellington at Hyde Park Corner was erected in 1888. A monument to Sir Hugh Middleton, who brought the New River water to London, has been erected on Islington Green. Among other memorials are: The Westminster Crimean Memorial, in the open space at the west of the Abbey; the Peabody statue behind the Royal Exchange; an equestrian statue of Prince Albert in Holborn Circus, a statue of Carlyle on Chelsea Embankment, and of Lord Beaconsfield in Westminster Palace Yard.

The Parks.—Of these the finest and most fashionable is Hyde Park (q.v.), which lies between the Uxbridge and Kensington Roads, and contains about 364 acres. Kensington Gardens (275 acres), with which Hyde Park communicates at several points, are beautifully wooded and finely laid out. Here carriages are not admitted. Saint James' Park (93 acres) extends from Buckingham Palace to the Horse Guards, and in its centre is an ornamental sheet of water, studded with islets covered with trees and shrubs, and around which swim a great variety of aquatic fowls. The Green Park, 53 acres in extent, lies between Saint James' Park on the south and Piccadilly on the north. Regent's Park, on the north side of London, covers an area of 472 acres. Round the park is a drive nearly three miles long, and an inner circular drive encloses the Botanic Gardens. At the north end are the Zoological Gardens, to which a fine broad avenue leads along the centre of the park. Battersea Park (200 acres) is on the south bank of the Thames, opposite to Chelsea Hospital. Victoria Park (217 acres) is in the northeast of London, laid out and planted as a place of recreation for the poorer inhabitants of this part of London. Southwark Park (63 acres) is another artificially formed recreation ground. Greenwich Park (185 acres) is one of the most delightful features of South London, and has great natural beauties; the famous Greenwich Observatory is situated here. There are many other parks acquired for use of the public during late years. Brockwell Park and Dulwich Park in the south; Avery Hill in the southeast; Finsbury Park and Clissold Park, on the north borders of London, are the most extensive. But even more typically a part of modern London are the numerous and beautiful heaths and commons preserved for the public: Hampstead Heath on the north, Hackney Marsh on the northeast, Blackheath and Plumstead Common on the southeast, and Totting and Streatham commons on the south.

Places of Popular Resort.—There are various places of popular resort in London. The Exhibition at Earl's Court, a vast open-air entertainment accompanied by exhibits of special descriptions arranged in courts and buildings within the grounds, is the largest. Olympia at Kensington is of less magnitude. The Zoological Gardens and the Botanical Gardens, both in Regent's Park, are very largely frequented. The People's Palace, established by contributions of the benevolent, in the East End of London (Mile-end road), and opened in 1887, provides a hall for concerts and other entertainments, a library and reading rooms, swimming baths, gymnasiums, social meeting rooms, winter garden, technical schools, etc. Outside London there are other places of this description. The most important is the Crystal Palace (q.v.), at Sydenham, formed to a considerable extent of the materials of the exhibition building of 1851, removed from Hyde Park. It was originally designed as a great educational museum of art, natural history, and ethnology; and its gardens and fountains were to rival or surpass those of Versailles. For years music has taken an important place in the arrangements of the palace. Entertainments of merely amusing character have also been largely introduced. A somewhat similar building is the Alexandra Palace, occupying a conspicuous site on Muswell Hill on the north. Kew Gardens (q.v.) on the west and Hampton Court Place (q.v.) and grounds, built by Cardinal Wolsey and enlarged by William III., are situated further out toward the southwest.

Lighting, Sewerage, and Water.—London is supplied with gas by seven separate companies. These companies include in their area of supply a considerable district outside London. Since 1886 a large number of electric lighting companies have come into existence; in 1905, 13 companies and 16 local administrations possessing statutory powers to supply electricity. The sewerage works with which the Metropolitan Board was charged, were formally opened in 1865. The system consists of lines of intercepting sewers on both side of the Thames intersecting the old outlets, which are retained for service during heavy rainfalls. It consists of three main lines on the north of the river, at different levels, called respectively the High Level, Low Level, and Middle Level Sewers; and of three on the south side, called the High, the Effra, and Low Level Sewers. The lines on the north side converge at Lea river, whence, after the Low Level sewage has been pumped to the higher level, the whole flows in five parallel brick culverts, built in an embankment upward of 5 miles in length, on to the Northern Outfall and reservoir, about 14 miles below London Bridge. On the south side the Low Level sewage is pumped to the higher level at Deptford, whence the whole is conveyed to a point near the mouth of the river. The total length of main and intercepting sewerage is 288 miles, and the area drained is 140 square miles. Considerable extensions are in progress. Works have been established for precipitating the sewage; the deposit after precipitation, amounting to 5,000 tons daily, is carried out to sea and deposited several miles from land. There were formerly eight companies supplying London and an extensive area around extending into Essex, Hertfordshire, Kent, Middlesex, and Surrey. In June and July, 1904, the undertakings of these companies were transferred to the Metropolitan Water Board. The total quantity of water supplied amounts to nearly 220,000,000 of gallons daily. Rather more than 122,000,000 of gallons of this is supplied from the Thames, 53,000,000, from the Lea, and 44.000,000 from springs and wells. By an act passed in 1852 all the companies making use of the Thames are obliged to draw from above the limit of the tidal flow. Even above this point the water is not free from pollution by the sewage of numerous populous towns and by the drainage of richly-manured land. Means are adopted for storing the water, and it is all filtered through layers of gravel and sand before entering the mains; but the system of supply is liable to various objections, and the total quantity is inadequate to meet the entire wants of the population. Commission after commission, and committee after committee, have examined and reported on this important subject, but in 1896, 1897, and 1898, the whole east end of London and much of the south suffered from want of proper water supply.

Cemeteries.—The provision of cemeteries for London is in the hands of the metropolitan borough councils and of private companies. Many of those provided by the borough councils and most of those under private management are situated outside the county. Amongst the latter may be mentioned Kensal Green Cemetery, in which several royal personages have been buried. It was opened in 1832, occupies about 70 acres of ground, and is tastefully planted and laid out. Kensal Green Roman Catholic Cemetery occupies 30 acres. Interments are permitted in St. Paul's Cathedral and Westminster Abbey. The City of London Cemetery is at Ilford, in Essex.

Communications.—The London population commands two systems of locomotion, namely, internal and external. The former has reference to the purely London requirements, and is by means of omnibuses, cabs, tramways, steamboats, and railways; the latter has reference to the connection of London with the rest of the kingdom and the Continent, and is by canals, railways, and the Thames. The internal traffic of London has become almost overwhelming. There were over 11,000 cabs, 3,500 omnibuses, and 1,700 tram cars licensed during the year 1904. There are also available the Metropolitan, the Metropolitan District, and the Electric Railway systems, and the local systems on other lines. These are extending in all directions. The great English railways long ago reached the limit of their ability to cope with suburban traffic in and out of London. The old underground railway was designed to be complete in an inner and outer circle, but the outer circle was found to be insufficient before it was built, while the inner circle does not even touch what might be called suburbs. Yet so long as it was without competition the two companies owning this system drew great dividends and ignored the demands of their dependent patrons for better service. Not until competition arose in the shape of the Central London electric tube railway did the directors of the District and Metropolitan Lines bestir themselves. American enterprise in acquiring control of the District Underground brought a flood of underground railway schemes forward, and parliamentary committees have been kept busy deciding between rival schemes. They have been careful to reserve all manner of rights to the government, refusing, for instance, to grant any route unless the proposed company agreed to provide and maintain a subway for pipes and wires along its lines. This is an effort to unravel the tangle of such things which the least upturning of the streets shows. These lines are also refused complete independence of each other, and are compelled to arrange transfers and joint time tables. In March 1906 there were 20½ miles of deep railways open for traffic in the county, while 41½ miles were authorized to be constructed in Greater London. The cost of such railways varies from £377,200 to £907,680 per mile of double line of rails, including stations. The great objection in London to shallow tram-subways, such as are now used in Paris and in New York, is the necessity of torn-up streets for a long period, as well as the difficulty of disposing of the soil so near the surface. The tubes, after the fashion of burrowing animals, must necessarily dispose of their soil at the end of their tunnel only. It is safe to predict that in ten years it will actually be possible to traverse London by public conveyance more quickly than one could walk or go in a cab. Now, for lack of means, or of cooperation when there is means, the task is hopeless. The number of passengers who traveled in 1904 on the cars owned by the two principal omnibus companies amounted to nearly 289,000,000 and passengers by tramways amounted to nearly 434,000,000. Previously to 1905 the Thames had almost been allowed to drop out of existence as a local traveler's route. By the Thames River Steamboat Service Act, 1904, however, the London County Council obtained powers to run steamboats on the Thames and the service was inaugurated by H. H. H. the Prince of Wales on 17 June 1905. The total number of passengers carried from that date to 31 March 1906 was 3,683,912, and by tramways nearly 300,000,000. The principal railway stations are: The Great Eastern, Liverpool Street, Fenchurch Street; the London, Tilbury, and Southend, Fenchurch Street; the London and North Western, Euston; North London, Broad Street; Great Western, Paddington; the Great Northern, King's Cross; Midland, St. Pancras; Great Central, Marylebone; South Eastern, London Bridge, where there is a congeries of stations, Charing Cross and Cannon Street; London, Chatham, and Dover, Ludgate Hill and Victoria; the London, Brighton, and South Coast railway, Victoria and London Bridge; the South Western, Waterloo. Many of these stations communicate by the Metropolitan and District railways, distinct systems, but both popularly known as the «underground,» affording means of internal communication within the city. Many of the termini are elaborate piles of costly architecture, and have associated with them large and handsome hotels. The Thames affords communication by steam vessels with the most important points on the British and Continental coasts, as well as with all parts of the world.

Manufactures.—It is impossible within the limits of this article to specify the different kinds of articles manufactured in London. It contains the largest breweries, distilleries, and sugar refineries in the kingdom; was long the principal seat of silk weaving; has extensive manufactures in metal, including machinery of all kinds, plate jewelry, watches, and brass work, and an enormous production of books and prints. Millinery, the making of clothes and of boots and shoes, are also extensive branches of industry. Besides these, there are cabinet making, coopering, coach building, rope making, leather working, hat making, ship building, mast making, etc., all of which are departments of manufacture conducted on a large scale; and there are numerous extensive chemical works, soap manufactories, and dye works. It is not generally known that London is a very large manufacturing centre.

Commerce, Docks, etc.—The port of London extends from London Bridge to the Nore and is divided into the Pool, Limehouse Reach, Greenwich Reach, Blackwall Reach, etc. It is under the care of the corporation of the city for sanitary purposes, under the Thames Conservancy for navigation, and under all sorts of other authorities for various other purposes. It is probably the worst managed port in the world. The docks, some of which are of great extent, are surrounded by wharves, sheds, storehouses, vaults, and warehouses of the most spacious kind. St. Katherine's docks, London docks, the West India docks, the East India docks, and the Millwall docks (in the Isle of Dogs) extend along the north side of the river at intervals from the Tower to Blackwall; and on the south side, between Rotherhithe and Deptford, are the Surrey Commercial docks. The tide rises 18 feet at springs and 14 feet at neaps at the London docks; and the depth at low water, spring tides, on the outer sill of St. Katherine's docks is 10 feet. The largest of these older docks is the West India import dock, 2,600 feet long and 500 broad. The dock accommodation of the port was greatly increased by the construction of the Victoria and Albert docks, which follow next in order on the north side of the river (opposite Woolwich) and have a combined length of 2½ miles, with a water area of 177 acres. The Victoria dock was opened in 1855, the Albert dock in 1880. The depth over the sill of the east entrance of the latter at high water is 30 feet. Besides these, there are now the splendid docks at Tilbury, on the Essex shore opposite Gravesend, constructed for the purpose of admitting the largest vessels at any state of the tide. Here there are a tidal harbor, graving dock, 3 miles of quays, sheds covering 20 acres, etc. The vessels belonging to the port in 1904, numbered 1,404 sailing and 1,840 steam; aggregate tonnage, 2,111,107. Its exports of British and foreign produce in 1904 amounted to £94,996,101; the imports to £174,475,656. Out of 11,092 vessels that entered in the foreign and colonial trade in 1904, 6,034 were British, 1,403 Dutch, 893 Norwegian, 1.011 German, 401 Swedish, 289 Danish, 354 Belgian, 287 French, 214 Russian, 103 Spanish, 29 Italian, 31 Austro-Hungarian, 22 Greek, 8 United States, and 13 of other nationalities, the total of all foreign vessels being 5,058. For East and West India produce London is the great port; tea, sugar, tobacco, wine, corn, timber, tallow, hides, wool, and drugs form large items.

The amount of customs revenue received in 1910 was £30,348,000. The value of the imports is about one-third, of the customs revenue forty per cent. of the whole amount for the United Kingdom.

The following table gives particulars for 1904 of the shipping entering and clearing at the port of London from and to foreign countries and British colonies and coastwise:

1904.	Sailing.	Steam.	Tonnage.
Entered.			
Foreign	1,360	7,876	7,652,514
Colonial	312	1,544	3,135,698
Coasting	4,060	11,946	6,285,640
Total	5,732	21,366	17,073,852
Cleared.			
Foreign	995	6,359	6,007,098
Colonial	136	665	1,843,849
Coasting	5,300	14,016	8,400,527
Total	6,431	21,040	16,251,474

Administration.—London is governed by the county council with the city corporation and 28 metropolitan boroughs administering local matters. The most ancient civic officer of London is the lord-mayor of the city of London. He is annually elected from among the aldermen who have been sheriffs of the city, on 29 September, and installed in office on 9 November, when a procession takes place, called the lord-mayor's show. The court of aldermen consists of 26 members, including the lord-mayor. They are chosen for life by the taxpayers of the wards. There are 27 wards. One alderman is elected for each of 24 wards, one for 2 wards, and one serves (*is not elected*) for a nominal ward. They are properly the subordinate governors of their respective wards, under the jurisdiction of the lord-mayor, and preside over the business in the courts of Wardmote. The civic sheriffs. two in number, are annually chosen by the livery or general assembly of the freemen of London. The common council is a court consisting of 206 representatives returned by 26 of the wards in proportion to their relative extent; the 27th, or Bridge Ward Without, being represented by an alderman. The general business of this court is to legislate for the internal government of the city, its police, revenue, etc. The recorder is generally a barrister of eminence, appointed for life by the lord-mayor and aldermen as principal assistant and adviser to the civic magistracy and one of the justices of oyer and terminer. The «livery» of London is the aggregate of the members of the several city companies, of which there are 75. Of these 12 are termed great companies, and from one or other of them the lord-mayor was formerly chosen. In order of precedence they are: The Mercers, Grocers, Drapers, Fishmongers, Goldsmiths. Skinners, Merchant Tailors, Haberdashers, Salters, Ironmongers, Vintners, Clothworkers. Many of the companies are very rich and possess large halls. Besides the ancient city of London there are under the act of 1899, the 28 metropolitan boroughs, already enumerated, each of which for local purposes is governed by a mayor, aldermen, and council. The county council consists of the chairman of the council, 19 aldermen, and 118 councillors, the latter being elected by the taxpayers of the several divisions, which are, however, not coincident with the boroughs. Other London authorities are 31 Boards of Guardians, dealing principally with poor relief; 4 Boards of School District Managers and 2 Boards of Sick Asylum District Managers, appointed from among their own number by the guardians of those unions which are combined into districts; the Metropolitan Asylum Board, partly elected by the guardians and partly nominated by the Local Government Board, and whose chief duty is provision for infectious sick and harmless insane; the Central (unemployed) Body and 29 Distress Committees, for the provision for distress from lack of employment, the latter appointed by the City of London Corporation and the metropolitan borough councils, the former (with the exception of 8 members) appointed by the London County Council. the Distress Committees, and the Local Government Board; the Metropolitan Water Board, appointed by the London County Council and the local authorities in the area supplied by the Board.

The Police.—The city police, confined to the city proper, is administered by the city corporation as a municipal force, and numbers about 1,150 men. The metropolitan police is not municipal. It is administered by a commissioner appointed by the Home Office. It consists of nearly 17,000 men, whose central offices are New Scotland Yard, a massive building on the Embankment near Westminster Bridge. Its area of jurisdiction extends for 15 miles from Charing Cross.

For postal purposes the authorities divide the major portion of Greater London into districts designated by their initial letters, E. C., W. C., W., S. W., S. E., E., N., N. W., signifying East Central, West Central, etc.

Sociology.—The population of the county of London in 1901 was 4,536,541. Of this number 1,202,072 were born in England (outside London), 56,605 in Scotland, 60,211 in Ireland, and 38,899 in other parts of the British empire. The alien population numbered 79,804 males and 55,573 females. The average birth-rate per 1,000 of population in 1904 was 27.9, as compared with 29 in 1901, 30.3 in 1891-1900, 33.2 in 1881-90, 35.4 in 1871-80, 35.4 in 1861-70, and 33.6 in 1851-60. There are 1,118 females for every 1,000 males. Out of every 1,000 persons of marriageable age, 367 males and 372 females are unmarried. In 1903, 36,672 bachelors were married, 37,413 spinsters, 3,590 widowers, and 2,849 widows. Of the total number of marriages 68.6 per cent. took place in the Established Church, 19.1 per cent. in the registry office, and 4.7 per cent. in the Nonconformist churches. Of the 135,377 foreigners, not naturalized British subjects, natives of Russia are the most numerous; Germany stands second, Russian Poland follows, France is fourth, and Italy fifth. The Russians in London have increased since the last census from 12,034 to 38,117—fully three-fold, that is—while Italy has doubled her contribution toward the population, now accounting for a round 10,000. Natives of the United States numbered 5,561.

History.—Though, by the evidence of its name and by archæological remains, London was occupied by the Celtic Britons before the arrival of the Romans, it was not till the Roman era that it became a place of importance. There were probably two Roman Londons: the first destroyed by Boadicea and probably consisting of the area extending from near the Tower on the east by the course of the Langbourne (now preserved in Langbourne ward; on the north, by the course of the Walbrook on the west and the Thames on the south; the second probably coincident with the mediæval walled city. The Roman walls were destroyed by the Danes and were restored by King Alfred. After the Romans left Britain, London assumed a certain amount of independence, and throughout the Anglo-Saxon period it appears to have supported the monarch who was acceptable to the rest of the kingdom. Alfred was the first king of the Anglo-Saxons who thoroughly understood the importance of its military position. It suffered by fire in 764, 798, and 801. It was sacked by the Danes, who obtained a considerable settlement in Southwark and on the western boundary of the city beyond the Ludgate. At the Conquest London treated with and finally submitted to William. William's first act was to dominate the city by building his military stronghold, the beginnings of the Tower of London. He then granted the city its ancient rights by a charter, which is still preserved; on the accession of Henry I. a new charter was granted, and the charter grants increased considerably under the Plantagenets, while its municipal privileges were made the standard for governing many of the municipal boroughs in the provinces. London sided with Stephen against Matilda, took part in the struggle against John for Magna Charta, was severely oppressed by Henry III., strongly supported Edward IV. and the Yorkist party in the wars of the Roses, and was faithful to Richard III.; it equipped and dispatched ships to the navy collected to fight the Spanish Armada, and its citizens, officered by the aldermen of the city, fought for the Parliamentarian side against Charles I. Under the later Stuarts and the Georges it became more political than municipal and lost much of its ancient power. In the reign of Henry II. the walls on both sides of the river are described in a contemporary account as supplied with numerous towers; London Bridge, erected instead of a wooden one, was begun in 1176 and finished in 1209. This was to a great extent the same that was taken down in 1832. In 1218 the forest of Middlesex was cleared, and that portion of London north of the city began to be built. In the year 1328 the village of Southwark was incorporated with the city, as it had previously served as a place of refuge for malefactors. In 1349 and 1361 London was visited by the plague. In 1381 broke out the rebellion of Wat Tyler, who fell by the hands of the lord-mayor, hence the dagger on the city arms. In 1416 street lamps were introduced; in the same century some of the principal streets were paved, and wooden houses began to be replaced by others of brick. In the next century improvements were continued, and Westminster was connected with the city by a row of noblemen's mansions along the river, the last of which, Northumberland House, has made way for the road leading from Trafalgar Square to the Embankment. In the 17th century, Spitalfields was covered with houses, and the space north of the Strand as far as Holborn, and from Temple Bar to St. Martin's Lane, was extensively built on, as well as the neighborhoods of Charing Cross and Pall Mall. The New River was completed and many houses were supplied with water; sewers were dug; smooth pavements were laid down for passengers, and hackney coaches came into general use. But the streets were so narrow and dirty and the houses in so filthy a state that the city was scarcely ever exempt from the plague, which sometimes committed great ravages. In 1666 the great fire broke out and spread over 336 acres, destroying 13,200 houses, 90 churches, and many public buildings. In rebuilding, considerable improvements were introduced, and a fire in Southwark 10 years after gave a similar opportuninty of improving that district. Population and trade now rapidly increased, partly from the immigration of French Protestants driven from their country by the revocation of the Edict of Nantes. In the 18th century London steadily advanced in extent, prosperity, and splendor. In 1780 took place the Gordon Riots, when the mob was in possession of London for two days and committed frightful havoc. Since that disgraceful outbreak the peace of London has never been seriously endangered, and the troops stationed in and around the capital, together with the effective police force that now exists, seem quite adequate to insure it against any similar disturbance. The extension and improvements which took place during the 19th century are greater than in any former period, and further changes of great importance are in operation. The most remarkable event of the century in the history of London was the carrying into effect in 1851 of the first great truly international industrial exhibition, which has since led to numerous exhibitions of a similar kind both there and abroad. In 1862 took place the second great international exhibition, and since that time various exhibitions of an international character and largely representing the colonies have been held in specially constructed buildings at South Kensington. The history of London contains many episodes of vast importance to the nation as well as to London itself. As now united for government, it will have to face problems of vast moment. The largest, most populous, and richest city that civilization has ever produced, the study of its history and its development must ever be of great importance and interest.

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London Cities and Boroughs. The County of London, nearly 120 square miles in area, is split up into 29 districts for local administrative purposes. Of these, two are cities, those of London and Westminster; one is a Royal Borough—Kensington—and 26 are boroughs. Each is self-contained and self-governing for all purely local matters, and the different districts are clearly defined and recognized. There are other areas for other purposes—for instance, the Poor Law is administered by 31 duly elected Boards of Guardians, but the districts controlled by these Boards do not exactly correspond with those governed by the Borough or City Councils. It is expected that future legislation may do away with this anomaly and make the Poor Law areas the same as those of the boroughs, possibly also abolishing the Boards of Guardians and transferring their duties to the Borough Councils. On the other hand there are those who predict the abolition of the Borough Councils also, and the unification of London under one central authority. The present system leaves much to be desired, if only for the equalization of rates, each borough differing from the others in the amount annually required—the inhabitants of the poorer districts, with their smaller rateable value, having as a rule to pay much higher rates than their more fortunate fellow citizens in districts where better conditions prevail.

Up to 1855 there was no uniformity of any sort for local administration. The City of London, the "one square mile," had from time immemorial of course been a recognized unit, with well-defined duties and responsibilities, but round it had grown up a number of districts, north and south of the river, each with different forms of administration, obtained in most cases by special Acts of Parliament. In 1855 the Metropolis Management Act attempted to reduce chaos to cosmos. It created 23 administrative vestries and 15 Boards of Works elected by the smaller vestries, in addition to the City Corporation. These bodies again elected representatives to serve on the Metropolitan

Board of Works. The latter gave place to a directly elected body—the London County Council—in 1889. In 1899 the London Government Act was passed and came into force on 9 Nov. 1900. This Act left the London County Council and City Corporation untouched, but abolished all the vestries and local Boards of Works (of which there were 29 and 12 respectively at the date of the Act), setting up in their places 28 Borough Councils, of various sizes, rateable values, and population. The smallest one is Holborn, with 405 acres, and the largest Wandsworth, with 9,285. In point of view of population, Stoke Newington is the smallest with 52,353, and Islington the largest with 334,991.

Each borough is governed by a mayor, aldermen, and councillors, the numbers of the two latter being fixed by an Order in Council. The maximum number of members of the councils are 10 aldermen and 60 councillors in addition to the mayor, who need not previously have been a member of the council, but must be qualified to be one. The mayor may receive any remuneration the council may think reasonable. He is also, by virtue of his office, a justice of the peace for the county borough for the year of his mayoralty and the succeeding one. No one can be elected to any council unless he is either a parochial elector, or has resided in the borough for 12 months preceding his election. It is noticeable that by a special provision in the Act no woman is eligible to hold any of the above offices, although this was not the intention when the Bill was introduced. Once elected the councils remain in office for three years. The first councils took office on 9 Nov. 1900.

In the following series of short notices the principal features of these municipal districts are detailed, the statistics in most cases being compiled from the latest issued by the London County Council. Space does not allow of any additional facts to be given, but the most important local histories are mentioned, to which the reader is referred for further information.

City of London.—The City of London contains an area of about 673 acres, a rateable value of £5,360,197, and an estimated population of 25,523. The day population is estimated at considerably over a quarter of a million, and it is calculated that over a million people enter the City daily. The birth-rate is 13.8 per 1,000, and the death-rate 16.0. The City Corporation consists of a Lord Mayor, 25 other aldermen (one for each ward of the city, and one for the Ward of Bridge Without, *i.e.*, Southwark), and 206 common councillors. The Lord Mayor is usually the senior alderman who has not held the office previously. He must have served as sheriff, to which dignity he has to be elected by the liverymen of the City Companies. Each year two names are selected by the livery to be submitted to the Court of Aldermen, with whom the final choice rests. The Lord Mayor has an official residence (The Mansion House) and an allowance of £10,000 a year. He usually is obliged to spend a considerably larger sum from his private purse, and is generally the recipient of some mark of Royal favor, the close of his year of office as a rule finding him a baronet. The aldermen are elected for life by the ratepayers of the various wards which each represents. The members of the Common Council are reappointed annually. The Lord Mayor is assisted in the ceremonial and other functions by two sheriffs, who also have many special duties of their own. They are elected by the liverymen, receive no allowance, but make considerable outlay from their private purses. One sheriff is always an alderman. Whilst the Lord Mayor is as a rule rewarded by being created a baronet, the sheriffs often receive the honor of knighthood, particularly if a Royal visit is paid to the City during their year of office.

As an administrative body the City Corporation has much fuller powers than any other corporation. It owns markets (receipts for 1903 £267,281; expenditure, including repayment of loans, £240,868) and controls its own police (independent of the Home Office, which is the ultimate head of every other police force in the country) at an annual cost of £179,060. Through the Bridge House Estate it keeps in repair the bridges connecting the City and South London (Tower, London, Southwark, and Blackfriars), and from this fund it has built the Tower Bridge and recently widened London Bridge. The charges under this head amounted in 1903 to £51,475. From it also will be provided the funds necessary to widen Blackfriars Bridge in order to allow trams to pass across it. As an educational authority it supports and controls the Guildhall School of Music (expenditure £30,505), the City of London School (£20,784), the City of London Girls' School (£3,930), and the Freemen's Orphan School (£6,883). The Guildhall Library (120,000 volumes) Museum (400,000 visitors, cost £6,610) and the Corporation Art Gallery (226,000 visitors, cost £3,208) also belong to the City.

Outside the "one square mile" the City Corporation controls and finds the money for the upkeep of a number of splendid open spaces and parks, the principal being Epping Forest, 5,347 acres; Burnham Beeches, 375 acres; and Wanstead Park, 212 acres. The total cost is £15,873 per annum. The total income of the City Corporation for 1903 was £1,279,897 and the expenditure £1,336,002. For 1904-5 the average rate made for the whole county of London was 7s. 3.8d. The lowest rate made in any one district was 6s. 2d. and the highest 10s. 2d. That of the city was 6s. 6.5d. The number of works published on London is legion. The following are typical: Knight, 'Old and New London' (1841-1844); Maitland, 'History of London' (1739); Sharpe, 'London and the Kingdom' (1894 and 1895); Welch, 'Modern History of the City of London' (1896); Wheatly, 'London, Past and Present' (1891).

Battersea has an area of 2,160 acres, a rateable value of £1,065,099, and an estimated population of 169,770. At the 1901 census it had 23,462 inhabited houses and 38,987 tenements. The birth-rate is 28.7 and the death-rate 15.3 per 1,000. The borough has many open spaces, notably Battersea Park (200 acres) and parts of Clapham and Wandsworth Commons. The council consists of a mayor, 9 aldermen, and 54 councillors. It controls three libraries with a stock of 54,384 volumes, has its own electricity supply and a municipal milk depot, as well as being a strong believer in its own works department, which was established in 1898. It has two buildings for public baths and one public wash-house. The district is mainly a working-class residential one and is famous as the home of the only labor member of the present (1907) Liberal Cabinet, the Right Hon. John Burns, M. P., President of the Local Government Board, who is also member of Parliament for the borough. Consult: Browning and Kirk, 'Early History of Battersea,' which is reprinted from the 'Collections of the Surrey Archæological Society' (1891); Green and Damer, 'Clapham Junction and its People' (1889); Hammond, 'Bygone Battersea' (1897); Simmonds, 'All about Battersea' (1882).

Bermondsey was created, as it now exists, by the London Government Act of 1899, and is made up of several districts, principally the two parishes of Bermondsey and Rotherhithe. The borough has an area of 1,500 acres, a rateable value of £941,247, and an estimated population of 129,856. At the 1901 census it had 15,817 inhabited houses and 29,073 tenements. The birth-rate is 32.5, and the death-rate 19.0 per 1,000. There is only one large open space, called Southwark Park, but there are several small ones. The total area of all the open spaces of the borough is 75 acres. The council consists of a mayor, 9 aldermen, and 52 councillors. The borough possesses three libraries, with a total stock of 36,760 volumes. It also has its own electricity works, and a dust destructor in connection with them; two public baths and wash-houses. The district is very poor, and is the headquarters of the leather trade. Consult: Bell, 'History of Bermondsey' (1880); Besant, 'South London' (1899); Cassell's 'Old and New London'; Clarke, 'History of Bermondsey' (1901); Phillips, 'Bermondsey' (1841).

Bethnal Green, one of the poorest and smallest of all the London boroughs, has an area of 759 acres, a rateable value of £549,987, and an estimated population of 129,118. There is a great amount of overcrowding and a fairly high death-rate (18.4 per 1,000) as well as a high birth-rate (35.7 per 1,000), in fact, the third highest in London, being surpassed only by Finsbury and Stepney. At the 1901 census there were 14,005 inhabited houses and 28,209 tenements. There are six small open spaces and a portion of Victoria Park (about 70 acres). The council consists of a mayor, 5 aldermen, and 29 councillors. The borough possesses no public swimming bath, but has a set of ordinary baths and public wash-houses. There is no rate-supported public library, but there is a voluntary library, attached to which is a branch of the South Kensington Museum. Consult: Allgood, 'History of Bethnal Green' (1894); Gavin, 'Sanitary Ramblings—Sketches and Illustrations of Bethnal Green' (1848).

Camberwell is one of the largest of the London boroughs. It has an area of 4,480 acres, a rateable value of £1,364,397 and an estimated population of 263,611. Certain portions of the borough are thickly populated, while in others the opposite is the case. At the 1901 census there were 36,671 inhabited houses and 56,985 tenements. New houses are rapidly springing up in the outer fringe of the borough, and these figures have been largely increased. The birth-rate is 27.6 per 1,000, and the death-rate 14.2. There are several public open spaces, the two largest being Peckham Rye (112 acres) and Dulwich Park (72 acres), but in some of the districts, particularly Dulwich, large tracts of land are not built upon, and are used for recreative purposes. The council consists of a mayor, 10 aldermen, and 59 councillors. There are six libraries, with a total stock of 60,671 volumes, and an art gallery, one of two in London controlled by Borough Councils. The borough possesses three public baths and two wash-houses. Consult: Allport, 'Collections Illustrative of the Geology, History, Antiquities and Associations of Camberwell and Neighborhood' (1841); Blanch, 'Ye Parish of Camerwell: a Brief Account of the Parish of Camberwell, its History and Antiquities' (1875).

Chelsea has an area of about 660 acres, a rateable value of £888,133, and an estimated population of 71,332. Chelsea is mainly inhabited by the well-to-do class; at the census of 1901, there were 8,641 inhabited houses and 17,467 tenements. The birth-rate is 20.5 per 1,000 and the death-rate 15.8. The council consists of a mayor, 6 aldermen, and 30 councillors. There is one public library with a stock of 44,617 volumes, and also one building for public baths. Consult: Beaver, 'Memorials of Old Chelsea' (1892); Blunt, 'A Historical Handbook to Chelsea' (1900); Davies, 'Chelsea Old Church' (1904); L'Estrange, 'The Village of Palaces: Chronicles of Chelsea' (1880); Martin, 'Old Chelsea' (1889).

Deptford (Det'ford) has an area of about 1,563 acres, a rateable value of £629,695, and an estimated population of 111,060. At the 1901 census there were 15,823 inhabited houses and 24,615 tenements. The birth-rate is 30.1 per 1,000 and the death-rate 15.7. The borough contains but little in the way of open spaces, although it is within easy access of others. The council consists of a mayor, 6 aldermen, and 36 councillors. There is a public library recently erected (stock 15,600), and also an institution for public baths and wash-houses. Consult: Dews, 'History of Deptford' (1884).

Finsbury.—With the exception of Holborn, Finsbury is the smallest of the London boroughs in point of size, as it only contains 589 acres. Its rateable value is £1,022,302, and its estimated population 102,025. The borough is densely populated; at the 1901 census there were 9,280 inhabited houses and 24,097 tenements. It is badly off for open spaces, of which it has but 16 acres. The death-rate is very high, 21.2 per 1,000, and the birth-rate 37.1. The population is a decreasing one, owing to the proximity of the borough to the City of London; and the taking over of private houses for offices. The Baths and Wash-houses Acts have recently been adopted for the borough, which also possesses one central and two branch libraries, with a total stock of 29,300 volumes. The council consists of a mayor, 9 aldermen, and 53 councillors. The Clerkenwell district is the centre of the watch and jewelry trade. Consult: Cromwell, 'History and Description of the Parish of Clerkenwell' (1828); Mitton, 'Fascination of London' (1906); Pink, 'History of Clerkenwell' (1865).

Fulham has an area of 1,703 acres, a rateable value of £902,442, and an estimated population of 149,090. Although rapidly increasing in population there is still very little overcrowding. There are only five small open spaces, containing in all about 68 acres. At the 1901 census there were 18,534 inhabited houses and 32,137 tenements. The birth-rate is 32.5 per 1,000 and the death-rate 14.5. The council consists of a mayor, 6 aldermen, and 35 councillors. There are three public libraries (total stock, 39,000 volumes), baths and wash-houses. The council also controls the electric lighting of the borough, which was inaugurated in 1901. Consult: Ferèt, 'Fulham, Old and New' (1900). Volume 3 of this work also contains an exhaustive bibliography.

Greenwich (Gren-itch) has an area of 3,852 acres, a rateable value of £643,406, and an estimated population of 99,383. It is, as a whole, very thinly populated, although in some parts of the borough the reverse is the case. Some districts are practically in the country, and there the population is small. In West Greenwich, on the other hand, there are about 86 persons to the acre. At the 1901 census there were 14,240 inhabited houses and 19,702 tenements. The birth-rate is 27.3 and the death-rate 13.6 per 1,000. The borough has many open spaces, containing the Greenwich Park (in which is situated the famous Observatory), parts of Woolwich and Blackheath Commons, and other places, about 390 acres in all. The council consists of a mayor, 5 aldermen, and 30 councillors. At present there is only one public library, recently opened, with a stock of 9,700 volumes in the lending library (the reference library is not yet stocked), but another is in course of erection. There are public baths and wash-houses. Consult: Howarth, 'Greenwich' (1886); L'Estrange, 'The Palace and the Hospital' (1886).

Hackney has an area of 3,289 acres, a rateable value of £1,231,108, and an estimated population of 220,773. At the 1901 census there were 30,634 inhabited houses and 48,794 tenements. The birth-rate is 27.7 per 1,000, and the death-rate 14.5. There are 618 acres of open spaces in the borough, including Hackney Common and Hackney Marsh. The council consists of a mayor, 10 aldermen, and 60 councillors. At present there is no public library, but a grant of £25,000 has been received from Andrew Carnegie for buildings. There will be a central and two branch libraries, and it is planned to open the former at the end of 1907. The foundation stone was laid by Princess Christian in the early part of the year. The public baths are amongst the finest in London. The council also controls the electricity supply. Recent county council improvements have greatly widened the main thoroughfare of the borough—Mare Street, Up to 1894 Stoke Newington formed part of Hackney. Consult: Robinson, 'History and Antiquities of Hackney' (1842).

Hammersmith has an area of 2,286 acres, a rateable value of £801,488, and an estimated population of 114,765. The latter is rapidly increasing. At the 1901 census there were 15,198 inhabited houses and 25,810 tenements in the borough. The birth-rate is 25.9 and the death-rate 14.7 per 1,000. The principal open spaces are Ravenscourt Park and Shepherds Bush Green. There are three public libraries with a total stock of 41,984 volumes; a new central library has recently been opened, provided by Andrew Carnegie. Up to the present there are no public baths and wash-houses, but a site has been acquired on which a building will be shortly erected. The electric light is under the control of the corporation, which consists of a mayor, 6 aldermen, and 36 councillors. Consult: Atwood, 'Endowed Charities of Hammersmith' (1856;) Bowack, 'Antiquities of Middlesex' (1705); Burt, 'Historical Notices of Hammersmith' (1871); Faulkner, 'History and Antiquities of Hammersmith' (1839).

Hampstead (Ham-sted) has an area of 2,265 acres and a rateable value of £1,088,075. The population is mainly residential, of a well-to-do class, and is now estimated to be 84,895. The birth-rate is 17.1 per 1,000 and the death-rate 11.2, the latter being the lowest in any London district. At the 1901 census there were 11,294 inhabited houses and 16,998 tenements. The borough is managed by a council consisting of a mayor, 7 aldermen, and 42 councillors. There are 350 acres of open spaces, the principal one being the famous Hampstead Heath. There are five libraries, with a total stock of 69,000 volumes; public baths and wash-houses. The council also has its own electric light installation. Consult: Baine, 'Records of Hampstead' (1890); Howitt, 'Northern Heights' (1869); Park, 'Hampstead' (1814); White, 'Sweet Hampstead' (1900 and 1904).

Holborn (Ho-burn) is the smallest of the metropolitan boroughs in size, for it only possesses an acreage of 405. Its rateable value is £1,037,700, and its population 56,612. The borough links into one many small districts, and includes Lincoln's Inn, Grays Inn, Staple Inn, and part of Furnivals Inn. The birth-rate is 28.3 per 1,000 and the death-rate 20.6. At the 1901 census there were 4,703 inhabited houses and 13,790 tenements. There is considerable overcrowding, and, as has been seen, the death-rate is very high. The only open space is Lincoln's Inn Fields, containing 9 acres. The council consists of a mayor, 7 aldermen, and 41 councillors. There are two public libraries, with a total stock of 24,700 volumes, and public baths and wash-houses. Consult: Mitton, 'Holborn,' in the 'Fascination of London' series.

Islington has an area of 3,091 acres, a rateable value of £1,935,223, and an estimated population of 334,991, the largest of any London borough. The borough is almost entirely built on and only has about 40 acres of open spaces, the largest being Highbury Fields. The birth-rate is 26.6 per 1,000 and the death-rate 14.8. At the 1901 census there were 38,645 inhabited houses and 79,129 tenements. The council consists of a mayor, 10 aldermen, and 60 councillors. Through the generosity of Andrew Carnegie, who gave £40,000, there will soon be a fine system of public libraries, five in all. Up to the present only one has been opened to the public. It contains 25,000 volumes. Islington has three public baths and wash-houses. Consult: Coull, 'History and Traditions of Islington' (1864); Cromwell, 'Walks through Islington' (1835); Lewis, 'History and Topography of the Parish of St. Mary, Islington' (1842); Nelson, 'History and Antiquities of the Parish of Islington' (1823); Tomlins, 'A Perambulation of Islington' (1858).

Kensington contains Kensington Palace, the birthplace of Queen Victoria, and is called the Royal Borough of Kensington in consequence. It has an area of 2,291 acres, a rateable value of £2,395,590, and an estimated population of

179,026. The birth-rate is 20.0 per 1,000 and the death-rate 14.8. At the 1901 census there were 22,131 inhabited houses and 38,349 tenements. There are practically no open spaces, but on the western side of the Borough are Kensington Gardens, Hyde Park, Green Park, and Saint James's Park. The council consists of a mayor, 9 aldermen, and 60 councillors. There are three libraries, with a total stock of 54,558 volumes, and public baths and wash-houses. There is a certain amount of overcrowding, but the Borough contains some fine thoroughfares and a wealthy residential population. Consult: Burt, 'Historical Notices of Kensington' (1871); Faulkner, 'Kensington' (1820); Leigh Hunt, 'Old Court Suburb' (1855); Loftie, 'Kensington' (1888).

Lambeth is a long, narrow borough, extending from Waterloo Bridge to the London County boundary on the south, and contains 4,070 acres. It has a rateable value of £1,947,645 and an estimated population of 305,029. The birth-rate is 29.6 per 1,000 and the death-rate 15.7. At the 1901 census there were 41,511 inhabited houses and 70,887 tenements. There are 186 acres of open spaces, the chief being Brockwell Park. The council consists of a mayor, 9 aldermen, and 60 councillors. There are six libraries, with a total stock of 146,000 volumes; on this subject the borough owes much to the generosity of the late Sir Henry Tate and Andrew Carnegie. The public baths are among the finest of their kind, and were opened by the King in 1897. Consult: Allen, 'History of Lambeth' (1826); Hill, 'Electoral History of the Borough of Lambeth' (1879); Honey, 'Origin and Duties of Overseers of Lambeth for 300 Years' (1900); Tanswell, 'History of Lambeth' (1858).

Lewisham is the third largest of the London boroughs, containing 7,014 acres. It is very sparsely populated, only about 20 to the acre. The estimated population is 148,419 and the rateable value £1,061,059. The birth-rate is 26.2 per 1,000 and the death-rate 11.4. At the 1901 census there were 22,750 inhabited houses and 27,701 tenements. The borough is well off for open spaces, of which there are 266 acres, the principal being a portion of Blackheath (144 acres) and the Hilly Fields. The council consists of a mayor, 7 aldermen, and 38 councillors. There are five public libraries, with a stock of 51,886 volumes; and public baths. Consult: Hasted, 'History of Kent and the Hundred of Blackheath.'

Paddington has an area of 1,356 acres, a rateable value of £1,540,140, and an estimated population of 150,367. The birth-rate is 22.7 per 1,000 and the death-rate 14.0. At the 1901 census there were 17,624 inhabited houses and 33,661 tenements. There are 132 acres of open spaces, principally taken up in Kensington Gardens, of which 102 acres are in the borough. The council consists of a mayor, 9 aldermen, and 58 councillors. Before the London Government Act the district of Queen's Park was a detached part of Chelsea, but since then it has become part of the borough of Paddington. A small branch public library was established there and kept up by Chelsea. It is now maintained by the Paddington Council, but the Libraries Acts have not been adopted for the whole of the borough, so that Paddington is without a public library system under the Acts. In this respect it has as companions only two other London boroughs, Bethnal Green and Saint Mary-le-bone. There are two sets of public baths and one public wash-house. Consult: Bates, 'The Playground of Paddington' (1902); Robins, 'Paddington, Past and Present' (1853).

Poplar is a borough made up of the old districts of Poplar, Bromley, and Bow. It has an area of 2,328 acres, a rateable value of £839,779, and an estimated population of 169,227. The latter is very poor, and the death-rate very high. This has been reduced of recent years, but at one time the Bromley district had a death-rate of over 28 per 1,000; now it is 18.8, and the birth-rate is 34.5. The Isle of Dogs is in the borough, and this (part of the old Poplar district) is mainly occupied by docks. There is a considerable amount of overcrowding; at the census of 1901 there were 22,613 inhabited houses and 35,787 tenements. Except for a portion of Victoria Park there are only a few small open spaces. The council consists of a mayor, 7 aldermen, and 41 councillors. There are five public libraries, with a total stock of 34,351 volumes; three public baths and two public wash-houses. The borough has had its own electric lighting supply since 1900. Consult: Cowper, 'A Descriptive Account of Millwall.—Limehouse, Poplar, Blackwall, and Stepney' (1853); Forrow, 'The Thames and its Docks' (1877); Simmonds, 'History of Poplar' (1870); also the publications of the Committee for the survey of the memorials of greater London.

Saint Mary-le-bone (Marry-le-bun) has an area of 1,473 acres, a rateable value of £1,957,505, and an estimated population of 130,589. The latter is gradually decreasing, a fact due to the constant taking over of dwelling houses in some of the main streets, such as Edgware Road, Oxford Street, Regent Street, etc., for other than domestic purposes The birth-rate is 30.4 per 1,000, and the death-rate 17.6. At the 1901 census there were 13,536 inhabited houses and 31,623 tenements. There are about 372 acres of open spaces in the borough, of which 362 acres are comprised in that portion of Regent's Park and Primrose Hill which is in the borough. The council consists of a mayor, 9 aldermen, and 60 councillors. Several unsuccessful attempts have been made for the adoption of the Public Libraries Acts, in spite of an offer from Andrew Carnegie. Marylebone is one of three London boroughs in the same category, the others being Paddington and Bethnal Green. There is one building with public baths and wash-houses. The council has its own electric lighting undertaking, concerning which it has been recently involved in considerable litigation. Consult: Clinch, 'Marylebone and Saint Pancras' (1890); Smith, 'Account of the Parish of Saint Marylebone' (1833).

Saint Pancras has an area of 2,694 acres, a rateable value of £1,803,749, and an estimated population of 233,099. The class of population varies, and in some of the poorer quarters, notably Somers Town, there is considerable overcrowding. The birth-rate is 27.0 per 1,000, and the death-rate 16.9. At the 1901 census there were 23,715 inhabited houses and 57,045 tenements. There are 340 acres in open spaces, including portions of Parliament Hill, Waterlow Park, and Regent's Park. The council consists of a mayor, 10 aldermen, and 59 councillors. The Public Libraries Acts have been adopted, and a very fine system of libraries will shortly be inaugurated. Andrew Carnegie has promised £40,000 for buildings, and a central library and 4 branches will be erected. There are three public baths and wash-houses. The council controls its own electric light undertaking, being the first body in London to act in this direction. Consult: Clinch, 'Marylebone and Saint Pancras' (1890); Coull, 'History of Saint Pancras' (1861); Miller, 'Saint Pancras Past and Present' (1874); Palmer, 'Saint Pancras' (1870); Roffe, 'Perambulating Survey of Saint Pancras' (1865).

Shoreditch has an area of only 658 acres, and is the third smallest of all the London boroughs, the others being Finsbury and Holborn. The rateable value is £813,880, and the estimated population 116.608. Here again a gradual decrease is to be noted ,owing to the proximity of the borough to the City of London. In 1861 the population was 129,364. The number of inhabited houses has also declined; in 1861 there were 17,072, while at the 1901 census there were only 12,743, and 27,031 tenements. The birth-rate is 33.3 per 1,000 and the death-rate 20.4. The district is a very poor one, there is considerable overcrowding, and a high rate of infant mortality. There are only 6½ acres of open spaces. The council consists of a mayor, 7 aldermen, and 41 councillors. Its municipal enterprise is very great. There are two libraries, with a total stock of 40,228 volumes, baths and wash-houses, dust destructor and electric light undertaking. The council has also instituted municipal costermonger's stalls. Consult: Ellis, 'History and Antiquities of the Parish of Saint Leonard Shoreditch and Liberty of Norton Folgate' (1798).

Southwark (South'wark, sometimes Suth'-erk) is, as its name implies, the south town. It was formed by the London Government Act, 1899, from the districts of Saint Saviour's, Saint George-the-Martyr, Christ Church, and Newington. In olden times the main road from the south to the City passed through it. Locally the northern part is called the "Borough." This particular portion of the old Saint Saviour's district is remarkably rich in historical and literary associations. Southwark has an area of 1,141 acres, a rateable value of £1,305,548, and an estimated population of 202,144. Taken as a whole the district is a very poor one, and the overcrowding in the northern districts is terrible. There are huge blocks of tenement dwellings which help to give a total of 177 persons to the acre. At the 1901 census there were 20,878 inhabited houses and 47,808 tenements. The birth-rate is 32.5 per 1.000 and the death-rate 18.9. There are only 12 acres of open spaces, although Kennington Park is on the south border. The council consists of a mayor, 10 aldermen, and 58 councillors. There are 4 public libraries, and a fifth one, the gift of Andrew Carnegie, is in process of erection. The total stock of volumes is 72,000. There are two public baths and wash-houses. The electricity supply is in the hands of the council, but it has been the cause of much criticism. There is a market, known as the Borough Market, formerly owned by the Saint Saviour's district, the profits of which (£5,000 per annum) go to the relief of the rates in that part of the Borough. In like manner £8,000 per annum goes to the relief of the Newington district, from the Walworth Common Estate. The borough contains two cathedrals—one Church of England, and one Roman Catholic. The former was the ancient parish church of Saint Saviour's, and is situated near London Bridge. It contains a fine window presented by Mr. Choate. John Harvard was born in the Saint Saviour's district—the house has been recently demolished. Consult: Besant, 'South London' (1899); Boger, 'Bygone Southwark' (1895); Bowers, 'Sketches of Southwark, Old and New' (1903); Manning and Bray, 'History of Surrey' (1804-1805); Rendell, 'Old Southwark and its People' (1878); Rendell and Norman, 'The Inns of Old Southwark' (1888); Thompson, 'Southwark Cathedral: Its History and Antiquities' (1907).

Stepney was formed from the districts of Mile End, Limehouse, Saint George-in-the-East, Whitechapel, and Stepney. It has an area of 1,766 acres, a rateable value of £1,501,782, and an estimated population of 293,318. The overcrowding is very great, there being on an average 170 people to the acre. At the 1901 census there were 31,462 inhabited houses, and 61,113 tenements. The neighborhood is extremely poor, and is the headquarters of the Jewish and other aliens, many of whom are engaged in the tailoring trades. The population is increasing, although the number of houses is decreasing. The birth-rate is 37.6 per 1,000 and the death-rate 18.8. There are only 48 acres of open spaces altogether in the borough. The council consists of a mayor, 9 aldermen, and 60 councillors. There are 4 libraries, and a handsome addition has recently been made to that at Mile End, by the generosity of Andrew Carnegic. The total stock is 64,038 volumes. There are public baths and wash-houses. The history of Stepney has not been written separately. It will be found in the general histories of London.

Stoke Newington was, until 1894, a part of Hackney. In that year a separate vestry was created. As a result of the London Government Act of 1899, a portion of South Hornsey was added to it. Even now, though, it only has an area of 863 acres. The rateable value is £352,-976, and the population estimated at 52,353, the smallest of any London borough. The birth-rate is 21.0 per 1,000, and the death-rate 13.2. At the 1901 census there were 7,717 inhabited houses and 11,824 tenements. There is very little overcrowding. The borough contains a large area of open spaces, including Clissold Park (57 acres). Finsbury Park (115 acres) is on its borders. The council consists of a mayor, 4 aldermen, and 30 councillors. There is one public library, with a total stock of 30,200 volumes. Public baths are in process of erection. There is no separate history of this borough.

Wandsworth is the largest borough in London, but later on it may be divided. There are 9,108 acres in the borough, nearly 14½ square miles. The district includes Putney, Wandsworth, Clapham, and Streatham. It has a rateable value of £2,024,307 and an estimated population of 275,009. Speaking generally the inhabitants are well-to-do, there is little or no overcrowding, and a low death-rate. The latter is 13.0 per 1,000, while the birth-rate is 27.0. At the 1901 census there were 37,764 inhabited houses and 49,756 tenements. The borough contains a large area of open spaces, the total being 1,163 acres, including parts of Clapham and Wandsworth Commons, all Tooting and Streatham Commons, and Putney Heath. The council consists of a mayor, 10 aldermen, and 59 councillors. There are six public libraries, with a total stock of 50,448 volumes. In the Wandsworth section of the borough, there are public baths, which cost £40,000, and were opened in 1901. Consult: Arnold, 'History of Streatham' (1886); Grover, 'Old Clapham' (1887); Coward, 'Wandsworth and Putney'; with a 'Chapter on Pre-Historic Age' by G. F. Lawrence (1893); Hammond, 'Bygone Wandsworth' (1896), and 'Bygone Putney' (1898); Jackson, 'Putney: Past and Present' (1883); Mitton and Geikie, 'Putney, Hammersmith and Fulham' in 'Fascination of London' Series (1903); Morden, 'History of Tooting Graveney' (1897); Rudolf, 'Clapham before 1700 A.D.' (1904).

Westminster has the highest rateable value of any municipality in London, not excepting the City of London itself. It contains 2,503 acres, the rateable value is £5,960,099, and the estimated population is 174,271. By a special Royal Charter, granted by the late Queen, Westminster is a city. It was formed, by the London Government Act of 1899, from several other districts—Westminster, Saint George-Hanover Square, Saint Martin-in-the-Fields, etc. The birth-rate is 16.9 per 1,000 and the death-rate is 15.5. At the 1901 census there were 18,366 inhabited houses and 41,244 tenements. There are 723 acres of open spaces, nearly one-third of the whole city, including Hyde Park, Saint James's Park, the Green Park, and part of Kensington Gardens. In the city are also situated all the Government offices, Buckingham and Saint James's Palaces, Marlborough House, the Imperial Institute, the South Kensington Museums, Westminster Abbey, the Houses of Parliament, etc. One of the finest houses in the most fashionable part of London—Park Lane—is that rented by the present American Ambassador, Mr. Whitelaw Reid,—Dorchester House. The council consists of a mayor, 9 aldermen, and 59 councillors. There are five public libraries, with a total stock of 116,000 volumes. There are also five public baths. Consult: Besant, 'Westminster' (1895); Terry, 'Greater Westminster' (1899); Walcott, 'Westminster' (1849), in addition to the general history of London.

Woolwich (Wool-itch) is composed of three districts—Woolwich, Plumstead, and Eltham. It has an area of 8,277 acres (second only in size to Wandsworth), a rateable value of £782,901, and an estimated population of 127,345. Large districts are not yet built upon, the average being only 15 persons to the acre. The birth-rate is 30.4 per 1,000 and the death-rate 14.4. At the 1901 census there were 18,086 inhabited houses and 24,585 tenements. There are 355 acres of open spaces, the principal being Plumstead Common, Borstal Heath and Woods, Woolwich Common, and Eltham Common. The council consists of a mayor, 6 aldermen, and 35 councillors. There are three public libraries. The total stock of books is 75,000. The public baths are well patronized. Consult: Larking, 'The Domesday Book of Kent' (1869); Vincent, 'Records of Woolwich' (1890).

Henry D. Roberts,
Geographical Editor for Great Britain.

London, Ohio, village, county-seat of Madison County; on the Pittsburg, C., C. & St. L. and the Cleveland, C., C. & St. L. R. R.'s; about 26 miles southwest of Columbus and 65 miles northeast of Cincinnati. It is situated in an agricultural region. The manufactures are agricultural implements, lumber, shoes, and cigars. The village owns and operates the electric-light plant. Pop. 3,800.

London, Canada, city in the County of Middlesex, Ontario, at the junction of the north and south branches of the Thames River, midway between Niagara Falls and Windsor, about 23 miles north of Lake Erie; and on the Grand Trunk, the Canadian Pacific, the Michigan Central, and the Père Marquette R. R.'s. The principal manufactures are stoves, church furniture, car works, lumber products, chewing gum featherbone for corsets, cigars (about 20 factories), clothing, agricultural implements, carriages, electrical machinery and supplies, shoes, iron rolling mills, flour mills, cigar boxes, printing and lithographing plants, and cement products, such as brick, tile, etc.

The principal institutions are the Western University, the Academy of the Sacred Heart, the Provincial Asylum for the Insane, Victoria and Saint Joseph's Hospitals, two orphanages (Protestant and Catholic), the Children's Aid Society Shelter for Friendless Children, the Aged People's Home, Home for Incurables, Y. M. C. A., Public Library, Conservatory of Music, and Harding Hall, a college for young ladies. London is the diocesan headquarters of the Roman Catholic Church and the Church of England. It has two cathedrals—Saint Paul's (Anglican) and Saint Peter's (Roman Catholic)—and 32 churches of various denominations.

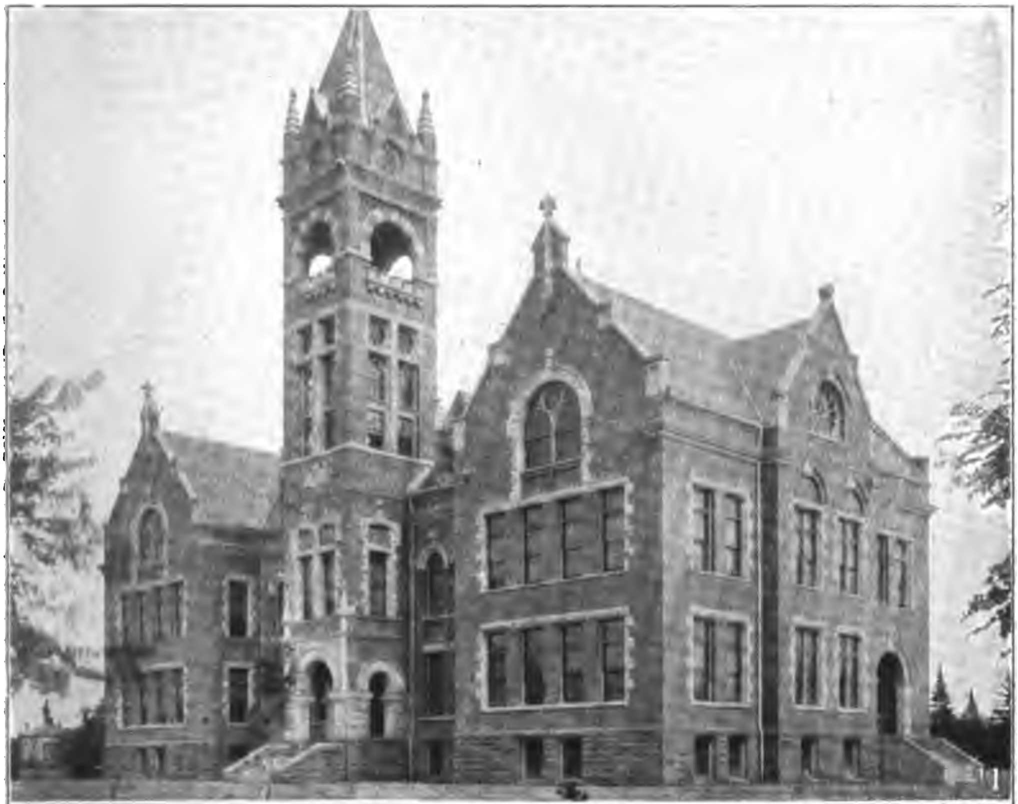
There are branches of 10 chartered banks and several loan companies in the city. About 30 public and separate (Catholic) schools, and a Collegiate Institute, accommodate a school population of about 8,000. The city is governed by a mayor and twelve aldermen, elected for one year.

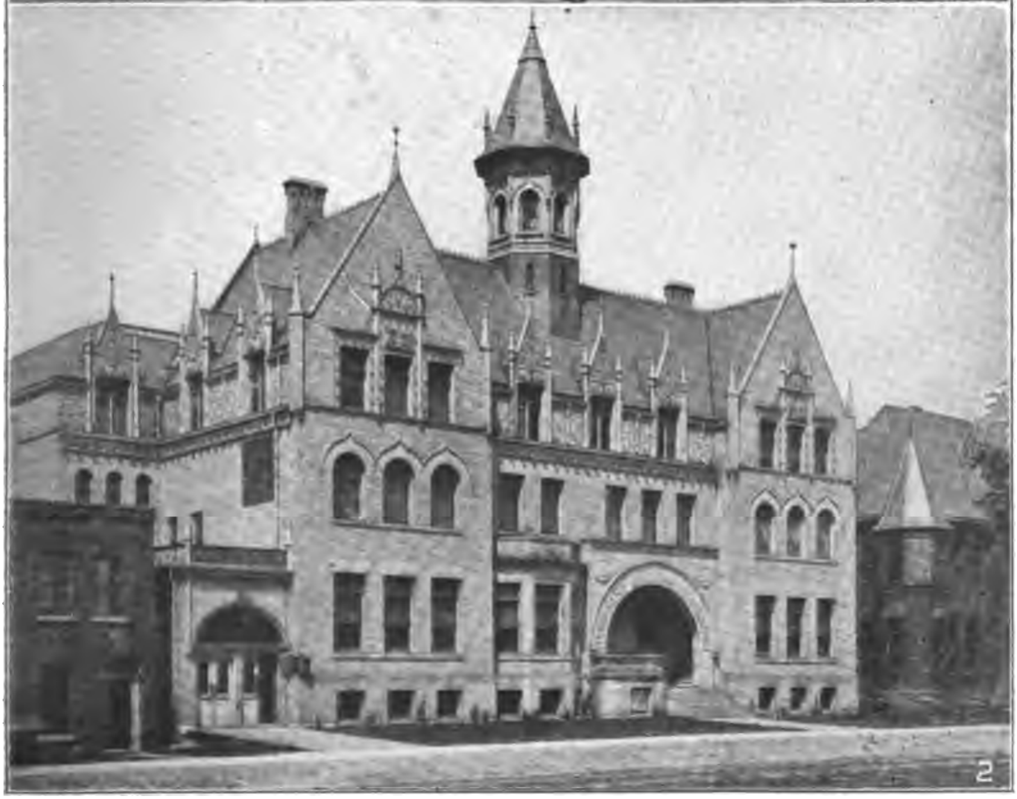
London Bridge. A celebrated bridge connecting the city of London with the Borough. It was designed by John Rennie and built by his sons (1825-31). Its dimensions are as follows: length, 928 feet; width, 54 feet; height above the river, 56 feet. An immense traffic passes over the bridge daily. The present structure took the place of a stone bridge (completed 1209), which was a short distance farther down the river.

London Clay, in geology and palæontology, a formation of the Lower Eocene Age; so called from its existing at or near London, England. It consists of a tenacious brown and bluish-gray clay, with layers of concretions called septaria. It has a maximum thickness of 600 to 700 feet.

London, Treaties and Conventions of. The following are the most important of the treaties and conventions concluded in London in modern times. The Quadruple Alliance, formed 2 Aug. 1718. On 6 July 1827, a treaty

LONDON, CANADA.





1. Normal School.

2. Young Men's Christian Association Building.

was signed between England, France, and Russia for regulating the affairs of Turkey and Greece, which led to the establishment of the Kingdom of Greece. On 22 April 1834, a quadruple alliance was formed between England, France, Spain, and Portugal against the claims of Don Carlos and Don Miguel to the crowns of Spain and Portugal. On 15 July 1840, a treaty was concluded between England, Russia, Austria and Prussia to compel Mehemet Ali to restore Candia and Syria to the Porte; and on 27 November, at the conclusion of a short campaign by an Anglo-Austrian army in Syria, Mehemet Ali agreed to the terms of the treaty. A convention to close the Dardanelles against ships of war was signed on 13 July 1841; and a convention between France and England for suppression of the slave-trade, 29 May 1845. Austria, France, England, Prussia, Russia, and Sweden were parties to a treaty signed 8 May 1852, for settling the succession to the Danish crown, and guaranteeing the integrity of its dominions in relation to the duchies of Schleswig-Holstein. The rights of the German Confederation were reserved and the claims of the Duke of Augustenburg on the duchies relinquished on satisfaction. On 13 March 1871, at a conference of the great powers, the neutralization of the Black Sea, effected by the treaty of 1856, was abrogated. The neutralization of Luxemburg was guaranteed by the five powers at the conference of London, 11 May 1867. The Convention of London, which was concluded on 27 Feb. 1884, between the Transvaal and Great Britain, abrogated the Pretoria Convention of 3 Aug. 1881, and instead gave the Transvaal (thenceforward to be known as the South African Republic) independence in regard to its internal affairs, but reserved to the queen the right of veto over all treaties concluded «with any state or nation other than the Orange Free State,» or «any native tribe to the eastward or the westward of the Republic.»

London University, England, established as a joint-stock company in 1825, received in 1836 two charters, one for an association retaining the name of London University, and having power to examine candidates and grant degrees, and the other for a teaching body — the University College — entitling it to prepare students for the degrees conferred by the university. The object was to render academic honors accessible to all classes and denominations without distinction. The university became purely an examining body, granting degrees to all who passed the prescribed examinations, but not undertaking any teaching functions. An influential movement in favor of the establishment of a teaching university in the metropolis arose, however, and from 1888 commissions had the matter in hand, and in 1898 the London University Act was passed to give effect to their recommendations. A commission appointed to draw up statutes and regulations for the university in accordance with the act had its work formally ratified 29 June 1900, and the newly constituted university was established, the government granting the eastern and central portions of the Imperial Institute building to the university for its accommodation.

The eight faculties comprise arts, science, law, medicine, theology, music, engineering, and economics and political science, and the degrees conferred are LL.D., LL.B., M.D., M.B., M.S., B.S., D.Sc., B.Sc., D.Lit., M.A., B.A., D.Mus., B.Mus. Candidates for any degree must first pass the matriculation examination, for which the subjects are Latin, English, mathematics, general elementary science, and one other subject selected from a prescribed list, including Greek, French, German, Sanskrit, Arabic, elementary mechanics, chemistry, sound, heat and light, magnetism and electricity and botany. For the ordinary degrees of B.A. and B.Sc. two other examinations must be taken. In the faculty of arts the highest degree is Doctor of Literature. Examinations are held at provincial centres as well as in London. The schools of the University, or institutions in which instruction is given, are: University College and King's College in all faculties; Hackney College, New College, Regent's Park College, Cheshunt College, Wesleyan College (Richmond), London College of Divinity in theology; Royal Holloway and Bedford Colleges in arts and science; the Royal College of Science; the South-Eastern Agricultural College, Wye; the medical schools of St. Bartholomew's, the London, St. Thomas's, St. George's, the Middlesex, St. Mary's, Charing Cross, and Westminster Hospitals, the London School of Medicine for Women; the Central Technical College of the City and Guilds Institute; and the London School of Economics and Political Science.

The supreme governing body is the Senate, consisting of the chancellor, 4 members appointed by the crown, 17 members elected by Convocation, 1 of them being the chairman of Convocation, 2 each elected by the Royal Colleges of Physicians and of Surgeons, 1 appointed by each of the four Inns of Court, and 2 by the Incorporated Law Society, 2 each chosen by University and King's Colleges, 1 representing the Corporation of London, 2 appointed by the London County Council, 1 representing the City and Guilds Institute, and 16 elected by the faculties. The Senate is debarred from imposing any religious test, or from imposing any disability on the ground of sex. There are three standing committees of the Senate, namely, the Academic Council, the Council for External Students, and a board to promote the extension of university teaching. The Chancellor, Vice-Chancellor, and Chairman of Convocation are *ex-officio* members of all three committees. Convocation consists of the Chancellor, the Vice-Chancellor, the members of the three standing committees, and the registered graduates of the university of prescribed standing. The parliamentary representative of the university is elected by the duly qualified male members of Convocation.

Lon'donderry, Charles William Stewart Vane, 3d MARQUIS OF, British military officer and diplomat: b. Dublin, Ireland, 18 May 1778; d. London 6 March 1854. He served under Sir John Moore and Sir A. Wellesley, in the Peninsula, distinguishing himself there at Talevera and other battles, and was English ambassador to Berlin in 1813. He was ambassador to Vienna the next year, and minister-plenipotentiary at its Congress in 1815. By his marriage with Miss Vane he succeeded to immense estates in the county of Durham, and devoted himself to their improvement and to the welfare of his tenantry. Under his original name of Stewart he wrote the 'History of the Peninsular War' (1808-13); 'Narrative of the War in Germany and France, 1813-4' (1830); and edited the 'Correspondence' of Viscount Castlereagh, his brother (1850).

Londonderry, Ireland, a city, seaport, county borough, and assize town, in the county of the same name, province of Ulster, on the Foyle, 23 miles from its mouth and 124 miles by rail north-northwest of Dublin. Waterside, a suburb on the opposite river bank, is united to the city by the iron Carlisle Bridge, 1,200 feet long. The houses of the town rise on the hill tier upon tier, while the summit is crowned by the cathedral. The ancient portion of the city is surrounded by a wall 1,708 yards long. It contains a small square, called the Diamond, from which four main streets diverge. The walls are pierced by seven gates, giving communication with other parts of the town, the greater part of which lies outside the walls. The most important public buildings are the guildhall, the county court-house, the post-office, the custom-house, the harbor offices, the jail, Gwyn's Institution, the model school, Magee College, Foyle College, St. Columb's College, the school of science and art, the lunatic asylum, and Ebrington Barracks. The harbor is commodious, and vessels of large tonnage can discharge at the quay, which extends for nearly two miles along the river, and is provided with a graving-dock. An extensive foreign, colonial, and coasting trade is carried on with English and Scotch ports, while Glasgow transatlantic steamers call three or four times a week at the mouth of the river. The principal export is agricultural produce; the chief imports are timber, grain, iron, coal, flax-seed, flour, and guano. Shirt factories employ thousands of workers, and there are timber-mills, grain-mills, foundries, coach-factories, bread and biscuit factories, distilleries, and a ship-building yard. Intermediate education is supplied by Foyle College, founded in 1617, and by St. Columb's Catholic College. Magee College opened in 1865, besides teaching secular subjects, has a theological course adapted to young men studying for the Presbyterian ministry. The Protestant cathedral is inferior to many parish churches in England. The Roman Catholic cathedral is a massive and magnificent structure, opened in 1873. The population is about equally divided into Roman Catholics and Protestants. Derry originated in a monastic establishment founded by St. Columba in the 6th century. It remained an ecclesiastical settlement until 1566, when it was occupied by the English in their wars with the O'Neills of Ulster. In 1608 the place was burned and the English governor slain by Sir Cahir O'Dogherty, one of the Irish chiefs of Donegal. During the 20 years that followed, the corporation of London, who obtained a grant of the place from James I., rebuilt the city, surrounded it with a wall, fortified it with cannon, and gave it a new name. Henceforth it was known as Londonderry. Here the Protestants of Ulster took refuge at the revolution, and held the fortress against the forces of James II., the siege lasting from April till August 1689; the defense by untrained men against superior numbers being regarded as one of the most heroic and successful military actions of modern times. Pop. about 45,000.

Lone Star State, The, a name given to Texas from the device on its coat of arms: one star, or a "lone star" in the centre of a wreath.

Lone Wolf (Guipago), a noted Indian chieftain of the Kiowa tribe: d. 1879. He became head chieftain of his tribe in 1866 but refused to bring the tribe into a reservation, in accordance with the Medicine Lodge treaty which he had refused to sign in 1867. General Custer after the battle of Washita had secured possession of Lone Wolf and Satanta and threatened to hang them both unless they consented to bring in their tribe, and this they finally consented to do in the spring of 1869. Lone Wolf, however, continued to maintain an attitude of defiance and in 1872 headed a delegation of his tribesmen to Washington to adjust their difference, but about this time his son and nephew were killed in Mexico while raiding and Lone Wolf immediately set out for Mexico at the head of a small party to secure their bodies and inflict vengeance on their slayers. Upon his return he headed the warlike portion of his tribe in the southern outbreak of 1874, the first battle with the troops taking place at the agency at Anadarko on 22 August. The outbreak was finally quelled by General Mackenzie in the spring of 1875; Lone Wolf, with the other chiefs one by one surrendered and were held prisoners at Fort Marion, Fla., from 1875 until May 1878, when those surviving were returned to their tribes.

Long, Charles Chaillé. See Chaillé-Long, Charles.

Long, Crawford W., American physician: b. Danielsonville, Madison County, Ga., 1 Nov. 1815; d. Athens, Ga., 16 June 1878. He was graduated from Franklin College, Pa., in 1835, and from the Medical School of the University of Pennsylvania in 1839, and after practising a short time in Jefferson, Ga., removed to Athens, Ga., in 1851. He claimed to have performed on 30 March 1842 the first surgical operation ever made while the patient was unconscious from inhaling ether. This appears to have been done in accordance with careful reasoning upon the subject, but although he repeated the experiment successfully in three other cases not far from that time the facts did not then become generally known. In December 1844 Dr. Horace Wells in Boston demonstrated practically the principle of anæsthesia by the use of nitrous-oxide gas, and in 1846 W. T. G. Morton followed him in a similar discovery, and publicly demonstrated the feasibility of employing anæsthetics in surgical operations. In 1902 the Georgia Medical Association proposed to place a statue of Long in the National Capitol as the discoverer of anæsthesia. See Anæsthesia.

Long, Eli, American general: b. Woodford County, Ky., 16 June 1837; d. New York 1903. He was graduated from the military academy at Frankfort, Ky., in 1855, and received an appointment as 2d lieutenant in the 1st United States cavalry, serving in the Cheyenne expedition in 1857. During the Civil War he was in active service in the Federal army, was several times wounded, and was brevetted brigadier-general of volunteers in August 1864. He captured Selma, Ala., in April 1865. He was mustered out of the volunteer service in 1866 and retired as major-general. For many years previous to his death he had lived in Plainfield, N. J

Long, John Davis, American lawyer and politician: b. Buckfield, Oxford County, Maine, 27 Oct. 1838. He was graduated from Harvard in 1857; taught in Westford Academy for two years; and studied law at Harvard law school and was admitted to the bar in 1861. He built up a large practice and became senior member of his firm, Long & Hemenway. He has been an active member of the Republican party; served in the Massachusetts legislature 1875–8, being speaker of the House from 1876–8, and was elected lieutenant-governor of the State in 1879; the next year he was elected governor, and re-elected in 1881. He was also for several years on the state house construction commission of the State. In 1883 he was elected to Congress, serving there till 1889; he was then a candidate for the Senate but was defeated, and did not hold public office till appointed secretary of the navy by President McKinley in 1897. He held this office through the Spanish War, conducting its affairs with marked ability, and resigned in March 1902. He published in 1879 a translation of the 'Æneid' of Virgil.

Long, Stephen Harriman, American engineer: b. Hopkinton, N. H., 30 Dec. 1784; d. Alton, Ill., 4 Sept. 1864. He was graduated at Dartmouth College in 1809, and after teaching school entered the United States engineer corps in 1814. He taught mathematics at West Point 1814–16, and was subsequently engaged for several years in surveys of the country west of the Mississippi River, as well as of the Upper Mississippi. Long's Peak in the Rocky Mountains was named in his honor. When the construction of the Baltimore & Ohio railroad was commenced in 1827 Long became chief engineer of surveys and introduced many improvements in wooden bridges, to adapt them for railroad purposes. In the construction of railroads he established a system of curves in locating roads. He served for some years on the board for the improvement of the Mississippi, and in 1856 was placed in charge of that work. He was appointed colonel of engineers in 1863, retiring the same year.

Long, William Joseph, American Congregational clergyman and author: b. North Attleboro, Mass., 3 April 1867. He was graduated from Harvard in 1892 and from the Andover Theological Seminary in 1895. He is the author of: 'The Making of Zimri Bunker' (1898); 'Ways of Wood Folk' (1899); 'Wilderness Ways' (1900); 'Beasts of the Field' (1901); 'Fowls of the Air' (1901); 'Secrets of the Woods' (1901); 'School of the Woods' (1902); 'Following the Deer' (1903); 'A Little Brother to the Bear' (1903).

Long Beach, Cal., a city in Los Angeles County, situated on the beautiful San Pedro harbor, directly south of Los Angeles about twenty miles distant. It is on the Southern Pacific R.R. and is connected by steamers with Santa Catalina Island. It has an excellent commerce in fruit and produce, as well as lumber, and is also well known as a watering place having many attractive scenic features and points of interest. Pop. (1910) 17,809.

Long Beach, L. I., a seaside resort, 25 miles from New York City, situated on an island just off the coast of Long Island, beyond Rockaway. It has a winter population of 300 and a summer population of 3,000. It is reached by the Long Island R.R. and has several hotels, many cottages, and a fine board walk 2½ miles long, built on concrete piles and girders. Steps are being taken to incorporate Long Beach as a borough.

Long Branch, N. J., city, in Monmouth County; on the Atlantic Ocean, and on the Pennsylvania, the New Jersey S., and the Central of New Jersey R.R.'s; about 35 miles by water, 45 miles by rail, and 30 miles in direct line south of New York city. During the summer season steamers run regularly several times a day between New York and Long Branch, and there are numerous electric and railway lines. The avenue along the bluff is a favorite walk. The long beach affords excellent bathing facilities. Large bulkheads have been erected to prevent destructions of the bluff by the action of the waves. The government is vested in a commission composed of seven members, who choose the mayor from among the number. Four of the commissioners are elected by wards, three at large, and all are elected annually. There are three banks with a combined capital of $200,000.

Long Branch is one of the oldest summer resorts in the United States. As early as 1670 settlements had been made along the coast. Colonel White of the British army, who owned the land where Long Branch is located and in the vicinity, about 1770, used to spend his summer months at this place. After the Revolution people from Philadelphia began to visit the place during the hot months, and in the last of the 18th century it had quite a reputation as a summer resort. Prior to its occupancy during the summer by people from New York and Philadelphia, it was frequented by fishermen and wreckers. Its proximity to New York, Philadelphia, and other cities gives it a large number of guests during the season. Pop. (1910) 13,298.

Chas. L. Edmonds,
Editor of Long Branch 'Record.'

Long Island, New York, the southeasternmost portion of the State, connected by three bridges and several ferries across East River with Manhattan Island; is bounded on the north by Long Island Sound (q.v.), separating it mainly from the south shore of Connecticut. The Atlantic Ocean bounds it on the east and south, while The Narrows, New York Bay, and East River, already mentioned, connecting the ocean with the Sound, complete the boundaries on the west and northwest. Several small islands around the coasts are included in its political boundaries, the best known being Coney, Rikers, Berrian, South Brother, Fire, Barren, Shelter, Gardiner, Fisher, and Plum. Long Island has a maximum length of about 120 miles, varies in width from 12 to 23 miles, and has an area of 1682 square miles. It is divided into four counties, Nassau, Suffolk, Queens, and Kings, the last two metropolitan boroughs of New York city, occupying a considerable portion of the western end of the island. Queens County embraces the populous centres of Long Island City (q.v.), Maspeth, Corona, Flushing, Jamaica, Woodhaven, and Far Rockaway, while the boundaries of Kings County are those also of the former city, now the metropolitan borough, of Brooklyn (q.v.).

The 280 miles of coast line are indented with numerous bays and inlets. A deep bay, 30 miles long, divided into Great and Little Peconic, and Gardiner's bays, splits the eastern end of the island into two long narrow peninsulas, the southern terminating at Montauk Point, and the northern at Orient Point, with Plum and Fishers islands extending beyond. Great South Bay, from two to five miles broad, extends along the southern coast for nearly half the length; it is separated from the Atlantic Ocean by Fire Island or Great South Beach, a sandy strip from a quarter of a mile to one mile wide, communicating with the ocean by several openings. Jamaica Bay is on the south coast also, New York Bay on the west, while along the north coast are Flushing, Little Neck, Manhasset, Hempstead, Oyster, Huntington and Smithtown bays. A government system of lighthouses, life-saving stations, fortifications, and masked batteries extends around the coast.

The level seacoast of the south side, with its extended views of bay and the broad ocean, contrasts sharply with the hilly north side and its deep indentations, looking out upon the land-locked Sound. The rolling stretches of Montauk Point and Shelter Island afford another contrast to the many square miles of scrub oak and level sandy plains in the centre of the island. The island reaches a height of over 380 feet in West Hill, Suffolk County, and in Harbor Hill at Roslyn, the loftiest points in the range of glacial hills that extends along the northern coast. The island is well watered by several small streams, the Peconic, 15 miles long, flowing into Great Peconic Bay, being the largest. Natural ponds or lakes abound, and there are about 116 square miles of salt marsh throughout the island. The eastern portion especially is well wooded and noted for its pine forests well stocked with deer and other game. Like other insular positions the climate is milder than that of the adjacent continent, the average temperature being several degrees below that of the metropolis, while the hottest days are tempered by cool and refreshing breezes from ocean or Sound. The soil generally is productive and under a high state of cultivation. In the southern flat lands it is of a light, sandy nature, well calculated for raising grain, especially Indian corn; in the hilly north the soil is strong and adapted to the culture of grain, hay, and fruits. Market gardening for metropolitan demands constitutes the principal portion of the agricultural industry of Kings and Queens counties. Oyster, clam, and other fisheries are important sources of food supply.

The Long Island and other railroads give easy access from New York city to the remotest parts, Montauk Point, the southeasternmost point, being only three hours away. Long Island is noted especially for exceptional opportunities, embracing all sorts of summer recreation. The roadways are admirably adapted to all forms of locomotion, and riding, driving, automobiling, and wheeling, are equally desirable methods for enjoying the region. In the numerous villages and towns along Jamaica Bay, Great South Bay, Peconic Bay and the Sound. there are ample facilities for sailing, rowing, fishing, and bathing, which are fully utilized. For golfing, lawn tennis, and all other forms of outdoor sport and recreation, every possible facility is found, and the golf courses, especially at Garden City and Shinnecock, are notable. The chief seaside resorts along the south coast are Bath Beach, Bensonhurst, Coney Island, Brighton, Manhattan, Rockaway Beach, Far Rockaway, Long Beach, Fire Island, Patchogue, and Montauk Point; along the north coast are Greenport, Port Jefferson, Coldspring Harbor, Oyster Bay, Glen Cove, Seacliff, College Point and North Beach. The population of Long Island in 1900 was 1,452,611, 1,166,582 of this number residing in Brooklyn borough.

When discovered in 1609 by Hudson, Long Island was inhabited by 13 tribes of Algonquin Indians, by whom the island was variously called Panmancke, Wamponomon, Mautowacks, and Sewanhacky. A few descendants mixed with negro blood, and retaining no knowledge of their ancient language, dwell near Montauk Point and Shinnecock Neck. French Protestants from near the river Waal, in the Netherlands, made the first settlement in 1625 under Dutch protection, and immigrants from New England established themselves in different localities shortly afterward. Lange Eylandt, the Dutch name, was changed by the colonial legislature to that of Nassau, a name which survives in one of the counties, but was never adopted by the people for the island. Long Island was a busy base of military movements during the Revolutionary War, and the Battle of Long Island (q.v.) is the principal event in its history.

Long Island, Battle of, one of the early American defeats in the Revolutionary War, was fought 27 Aug. 1776, in Brooklyn, N. Y., mainly within the present limits of Prospect Park, the column in Battle Pass to the memory of the 400 Maryland troops who fell in the battle, and the foundation remains of the redoubt on Lookout Hill, marking the central point of defense and attack. After the evacuation of Boston by the British, Washington made strenuous efforts to fortify New York and its approaches. General Greene, in command of a considerable body of troops, mostly raw recruits, was entrusted with the defense of Long Island, and constructed a line of intrenchments and redoubts from Wallabout Bay to Gowanus Cove. The main works at the Wallabout end were on the hill afterward known as Fort Greene, now marked by Washington Park. At Gowanus Cove, a battery was erected at Red Hook, and a fort on Governor's Island, nearly opposite. About two and a half miles from the intrenchments, between them and the southwest side of the island, the range of low hills in this section was then densely wooded and crossed by three roads; one on the right of the works passing near the Narrows to Gravesend Bay, the central one through Flatbush, and the third far to the left through Bedford to Jamaica. In the midst of his preparations, General Greene fell ill, and the command devolved upon General Sullivan, then just returned from Lake Champlain. Unacquainted with the ground and with Greene's plans the change of command caused considerable confusion. Nine thousand British troops landed in Gravesend Bay on 22 August without resistance; they were commanded by Sir Henry Clinton, assisted by Lords Cornwallis and Percy, General Grant and Sir William Erskine. Lord Cornwallis, rapidly advancing to the central pass, found it occupied by the rifle regiment of Colonel Hand, and without risking an encounter, took up a position at Flatbush. Washington inspected the American lines on the 24th, and placed General Putnam in command. The following day the British were reinforced by two brigades of Hessian troops, under General De Heister, and on the 26th began to carry out their plan of operations. The road through Bedford to Jamaica unfortunately had been comparatively neglected by the Americans, and eluding the patrol, the British contingent under General Clinton, accompanied by General Howe, the commander-in-chief, and by Lords Percy and Cornwallis, guided by a local tory, gained possession of the road and neighboring heights undiscovered during the night of 26–7 August. In the morning General Grant, with the left wing of the British army, advanced along the road by Gravesend and the Narrows, and was resisted by Colonel Atlee with a guard of Pennsylvania and New York militia, who retired fighting until he had fallen back upon General William Alexander (Lord Stirling), whose two regiments had hastened to his assistance. Here active firing was kept up by both sides without an attempt at a general action. At the same time, as diversions, De Heister opened up a cannonade from Flatbush upon Colonel Hand and his riflemen, while the guns of the British war-vessels were trained upon the Red Hook battery. Meanwhile on the right Clinton opened his guns upon the Americans, and at this signal De Heister advanced to storm the central pass and the redoubt of which General Sullivan had taken command. The latter, who found his left flank engaged and himself in danger of being surrounded, ordered a retreat, but not soon enough to escape the British light infantry, who drove him back upon De Heister and his Hessians. The Americans fought with desperate valor, a large body cutting their way through the intrenchments, the rest who were not killed either escaping among the hills or surrendering as prisoners, among the latter being General Sullivan. On the left Colonel Atlee and Lord Stirling, who had maintained their position in front of General Grant, found themselves cut off by Cornwallis. They gallantly attacked the enemy with such determination that the British held their ground only by the assistance of reinforcements, when Stirling seeing the uselessness of further resistance surrendered. Having forced all the approaches the British proceeded to invest the American works.

Washington arrived in the evening and took command, the following day bringing over additional troops. But with the formidable British force opposed to him, and indications that the British fleet intended moving up the river so as to cut the force in Brooklyn entirely off, Washington, on the night of 29–30, favored by a thick mist, made a strategic and masterly retreat to Manhattan, greatly to the discomfiture of the British, who were unaware of the movement until some time after the last American had crossed in safety. The Americans lost over 900 men in the battle, while the British loss in killed wounded and missing was 400. Consult: Carrington, 'Battles of the American Revolution' (1876); Dawson, 'Battles of the United States' (1858); Field. 'Battle of Long Island' (1869).

Long Island City, N. Y., formerly a city in Queens County, and second in size on Long Island, now in the borough of Queens, in New York city. It became a part of New York 1 Jan. 1898. As early as 1640 Dutch settlers had taken possession of the land in this vicinity, and gradually a number of little villages were formed on the western end of the island, on the East River and the Sound. In 1870 a number of the little villages, Astoria, Blissville, Dutch Kills, Hunter's Point, Middletown, Ravenswood, and Steinway, were united into one municipality and called Long Island City. Newtown Creek separates this section from the borough of Brooklyn. Ferries connect it with the borough of Manhattan. It has extensive manufacturing interests, several hospitals, a large number of churches, and schools. Consult: Kelsey, 'History of Long Island City.'

Long Island Sound, a body of water which separates Long Island, in New York State, from the mainland. It is an arm of the Atlantic Ocean, extending northeast and southwest; about 110 miles long and from 10 to 25 miles wide. It is connected with the Atlantic on the east by The Race, a narrow passage south of Fishers Island; and on the west by a strait called the East River, which enters New York Bay and through the Narrows to the ocean. The coast on the north is irregular, and has a number of small bays and capes. The south or Long Island coast is irregular from East River to near Port Jefferson; and from Port Jefferson to Orient Point the coast line has few indentations. The largest indentations on the north side are New Haven Harbor and Pelham Bay. There are several good harbors at the mouths of rivers and in places sheltered by small islands. On the south shore the principal indentations are Smithtown, Northport, Oyster, Manhasset, Little Neck, and Flushing bays. The north coast is fringed by small rocky islands or reefs. In the western part of the Sound there are a number of small islands, which have been improved so as to be desirable resorts or residential locations. Chief among these are Glen Island and City Island. At the entrance to East River there are a number of islands used chiefly by the health department of New York city. At the east entrance is a group of islands which extend diagonally from Long Island to the State of Rhode Island. The largest of this group is Fishers Island. (See NEW YORK CITY.) The chief rivers which flow into the Sound, all from the north, are Connecticut, Mystic, Thames, and Housatonic.

Since the improvements made (1865) at Hell Gate (q.v.), Long Island Sound is an available route for ocean steamers. The large passenger steamers which ply daily between New York and New England ports pass through the Sound. A large number of forts with modern equipment are located along the shores, thus guarding most carefully the entrance to New York city by this route.

Long Parliament, in English history, a Parliament summoned by Charles I. in 1640. Largely liberal and anti-royal, thanks to the campaigning efforts of John Pym, it declared ship-money illegal, claimed the right of taxation as belonging solely to the Commons and not to the Crown, passed the Triennial Bill, and, attacking the King's favorites put Laud in prison and Strafford to death. In November 1641, passing successfully a reactionary crisis, it adopted the Great Remonstrance, and in January of the next year refused to obey the king's order to surrender «the five members,» its leaders, Hampden, Pym, Hollis, Haselrigg and Strode. Thus it brought on the Civil War, through which it continued in power, losing however many members upon the introduction of Presbyterianism, and nearly 100 Presbyterians in 1648 after its attempted compromise with the king, which aroused the anger of the Parliamentary army. The handful of members left composed the «Rump,» which was nominally in power until dissolved in 1653 by Cromwell, after whose death it briefly reconvened in 1659 and 1660. See Cromwell.

Long-tailed Duck. See Old Squaw.

Long Tom, (1) the name given a 42-pound gun captured by the British in 1798 from the French battleship Hoche. It was afterward purchased by the Americans and used in the attack on Haiti by the French in 1804, and remained idle till 1812, when it was placed on the General Armstrong. This vessel ran the British blockade at New Orleans 9 Sept. 1814, and put into the bay near Horta, Fayal, being disabled in an encounter with a British squadron. Here the gun was dismantled and remained till Colonel Reid, son of the commander of the General Armstrong, had it brought back to New York 18 April 1893. (2) An apparatus for washing gold from the earth or gravel in which it is found. It consists of a wooden trough, from 12 to 25 feet long and about a foot wide. At its lower end it widens, and its floor there is of sheet-iron pierced with holes half an inch in diameter, under which is placed a flat box a couple of inches deep. A stream of water is kept running through it by means of a hose; the dirt is shoveled in, and stirred at the lower end, where the earth and gravel fall through the sieve into another box, where they are again sifted. The machine, like the «rocker,» was cheap and wasteful; and both were soon displaced by the sluice.

Long'acre, James Barton, American engraver: b. Delaware County, Pa., 11 Aug. 1794; d. Philadelphia 1 Jan. 1869. He was apprenticed in Philadelphia, and in 1819–31 was employed in the illustration of many of the foremost American works then published. At first with James Herring, and later independently, he published the 'National Portrait Gallery of Distinguished Americans' (1834–9), many of whose engravings were from sketches by himself. In 1844 he was appointed engraver to the United States mint, and from that time until his death designed all new coins. He also remodeled the coinage of Chile.

Lon'gan, a tree and its fruit. See Litchi.

Longard de Longgarde, Dorothea. See Gerard Dorothea.

Longchamps, lôṅ-shŏṅ, Paris, France, a celebrated racecourse on the southwest side of the Bois de Boulogne, where the race for the «Grand Prix» is run. Prior to its suppression in 1792, part of the site was occupied by the Convent of Longchamps, founded in 1260, a not too rigid retreat for ladies of the higher classes. It was a popular resort for carriage driving, especially during the week preceding Easter.

Longe, a local name (Vermont) for the lake trout (q.v.).

Longevity, lŏn-jĕv'ĭ-tĭ. The duration of life varies greatly in the same group of plants and animals, and great age in animals is by no means confined to the few higher vertebrates, such as the elephant, crocodile or parrot. Even so lowly an organism as the sea-anemone has been kept alive for 55 years. Low herbaceous annual plants in the temperate zone, have co-species in the tropics which grow to be trees and are perennial. Not only are individuals of a species long-lived, but certain species and genera exhibit wonderful vitality and have persisted throughout many geological ages, such are *Lingulella, Limulus, Ceratodus,* and certain foraminifers which have persisted since the Silurian period.

Causes of Longevity.— They have to do with the nature of the physical surroundings, and also depend on slow growth and late reproduction. Botanists find that great age in plants is dependent on slow growth, gradual propagation carried on late in life, on the solidity and hardness of the tissues, etc. Examples of great age in plants are the Sequoias or «big trees» of California, which are supposed to be over 3,000 years old; in fact, they are survivors of Tertiary times, since they occur in a fossil state in the polar regions in British Columbia and in Europe.

The longevity of certain species of animals has been attributed by Weismann to favorable environment, including temperature. He considers that the duration of life depends first upon the length of time which is required for the animal to mature, and upon the length of the period of fertility, the latter point being determined by external conditions. Undoubtedly another factor is heredity, since longevity is directly transmissible from parent to offspring, and great age runs in families.

As to longevity in the lower animals little is known. As a rule, they live but a few weeks, months, or years. The crayfish is said to attain an age of 20 years, and possibly the lobster may live to be as old as that. Lampreys preserved in Roman fish-ponds are said to have lived to be nearly 60. The crocodile, which never stops growing through life, lives 100 years. Pike and carp reach the age of 150 years. A gigantic salamander of Japan lived at least 52 years in confinement in Germany. As to the age of birds a writer in the British ornithological journal 'Ibis,' states that the following records of birds in captivity are authentic: raven 50, gray parrot 40 and 50, blue macaw 64, eagle-owls 53, and one was then still alive at 68 years. Certain aquatic birds are very long-lived, as a heron of 60, goose 80, mute swan 70. A goose still living in Rhode Island in 1903 is known to be 50 years of age. To what age in free nature these birds may reach is unknown. The elephant is known to live a century and the whale is supposed to be equally long-lived. The horse rarely reaches the age of 40, though according to Lawrence «Old Billy» of Manchester was known to have lived 59 years, and died at the age of 61, while Albertus, an old veterinarian, writes that he knew a soldier actually serving upon a horse which was 70 years of age.

Man sometimes reaches the age of 100 years, and in rare instances even exceeds that age; while heredity undoubtedly has most to do with great age, it may be promoted in those of medium height by quiet, regular habits, moderation in eating and abstention from or moderation in the use of stimulants and tobacco. Women attain a greater age than men. To show that in man the mean duration of life may be extended by good sanitation and improvement in the general conditions of life, the mean duration of life in France has risen from 20 years at the close of the 18th century to 40 years. The United States census report for 1900 on deaths that occurred in 271 cities of 5,000 population or more shows that 18.6 persons died in 1900 out of every 1,000, whereas in 1890 the number who died in the same cities was 21 out of every 1,000. The average age at death in 1890 was 31.1 years; in 1900 it was 35.2 years. If these statistics be accurate the saving of human life that has been achieved in a decade is enormous. Consult: Weismann, 'Essays upon Heredity, etc.' (Oxford 1889); Lankester, 'On Comparative Longevity in Man and the Lower Animals' (London 1870); Lolaville, 'The Duration of Human Life,' in the 'Popular Science Monthly,' Vol. XX., November 1881.

Long'fellow, Ernest Wadsworth, American artist: b. Cambridge, Mass., 1845. He studied under Couture in Paris, and among paintings by him may be named: 'Italian Pines'; 'Misty Morning'; 'John and Priscilla'; 'Old Mill at Manchester'; and a portrait of his father, Henry W. Longfellow, the poet.

Longfellow, Henry Wadsworth, American poet; b. Portland, Maine, 27 Feb. 1807; d. Cambridge, Mass., 24 March 1882. He was the second son of Stephen Longfellow, lawyer and congressman, and Zilpah, daughter of Gen. Peleg Wadsworth—thus coming from excellent stock on both sides. He seems to have combined the best characteristics of both parents and to have passed an ideal kind of childhood in the beautiful seaport town. His disposition was gentle, sympathetic, and studious, and his education was such as to bring out his finest qualities. He was encouraged to read the best English poetry and early began to write verses on his own account, doubtless finding in the success of his favorite volume, Irving's 'Sketch-Book,' encouragement to believe that a bright future lay in store for American writers.

In 1822 he entered Bowdoin College, of which his father was a trustee. He continued to lead much the same wholesome life he had led at home, avoiding rough sports, showing a chivalrous regard for women, especially his mother, reading and writing poetry, and performing faithfully his academic duties. Some of his poems were published in *The United States Literary Gazette*, of Boston, and brought him in a tiny sum of money besides an amount of notice altogether out of proportion to their merits. He also gave much thought to the choice of a profession, and, rejecting the law and, despite his piety and attachment to his faith, the Unitarian ministry, he fixed his mind upon the calling of a man of letters. His father prudently did not altogether thwart him, and soon another but not alien calling offered itself. He stood so well in his class—of which Nathaniel Hawthorne (q.v.) was a member—that the trustees proposed to him that he should go to Europe to fit himself to be the first incumbent of a chair of modern languages they had determined to establish. Their offer was accepted, and after a few months of study at home he sailed for Havre, landing there on 15 June 1826.

His friend George Ticknor (q.v.) had advised him to get all he could from the systematized scholarship of Germany, but Ticknor was in advance of his fellow countrymen, and Longfellow wisely followed his own instinct to steep himself in the color and movement and romance of the old world's life and literature. He was not idle—for in France, Spain, Italy, and Germany he cultivated his exceptional linguistic gifts and prepared himself for the main duties of his chair; but the end he proposed to himself was plainly culture, not scholarship. It was old-world culture and romance that the new world needed, and these Longfellow later showed that he could transmit even better than Irving had done, and much better than his light-hearted contemporary N. P. Willis (q.v.) was to do. Although his popular reputation will always be that of a poet, Longfellow's important place in the history of American literature is partly due to his eminent services as a translator and a transmitter of culture.

Although very young, the traveller made friends everywhere, both with natives and with fellow Americans, and although his precocious Muse was singularly silent for some years, he laid up a valuable stock of poetic impressions. There was a slight hitch with regard to his professorship, but this was overcome and he returned to America in August 1829 and entered upon his duties at Bowdoin. These he fulfilled with great success, acting also as librarian. He translated and edited textbooks for his students, with whom he always stood in friendly relations, he prepared his lectures carefully, he wrote articles for *The North American Review* on topics of foreign literature, and he published, in another magazine, sketches of travel, which were collected in 1835 under the title of 'Outre-Mer.' It was a quiet and useful life and one that was rendered still happier by his marriage in September 1831 to Miss Mary Storer Potter, of Portland.

A little over three years later he was invited to succeed Ticknor as Smith Professor of Modern Languages at Harvard, with the intimation that he would do well to spend some months in Germany before beginning his work. He sailed with his wife in April 1835, and spent the summer in Sweden and Denmark, studying the Scandinavian literatures, which were destined to have a strong influence upon his writings. In the autumn Holland was visited, and there at Rotterdam, after a protracted illness, his young wife died. Much affected, Longfellow went to Heidelberg and settled down for study, yielding his bereaved spirit all the more willingly to the influence of German sentiment and the not yet outworn romanticism of the epoch. Then, after some pleasant travelling in Switzerland, he returned home in October 1836.

Two months later found him at work in Cambridge and soon he was established in the famous Craigie House. He devoted himself to his lecturing and to superintending his assistants—foreigners, who gave him not a little trouble. He was no recluse, and enjoyed especially the society of such men as the historian W. H. Prescott (q.v.), Charles Sumner (q.v.), and that "heartiest of Greek Professors," as he was called by Dickens, whom Longfellow also knew pleasantly, Cornelius C. Felton (q.v.). Soon he resumed his long abandoned habit of writing verses, and after gaining popularity in the magazines through such pieces as 'The Psalm of Life,' he issued his first volume of poems, 'Voices of the Night,' late in 1839. It made an instant appeal, partly through its sound, moral didacticism, partly through its sentiment and its melody, both of which had been in considerable measure derived from Longfellow's study of German poetry. Earlier in the same year he had published a prose work equally or more indebted to German literature—'Hyperion, a Romance,' which was also very popular. This idealized record of his foreign experiences and the later prose tale of New England village life, 'Kavanagh' (1849), have long since ceased to hold the majority of readers, but 'Hyperion' was very important in his work as a transmitter of old-world culture. Late in 1841 his second volume of verse, 'Ballads and Other Poems,' with such moving pieces as 'The Wreck of the Hesperus' secured him in his position as the most popular of American poets—the singer whose songs have gone straightest to the largest number of hearts. There is evidence that he deliberately sought to move the people's feelings, and never was conscious literary effort more thoroughly successful.

In 1842 he paid a third visit to Europe, forming his memorable friendship with the German poet Freiligrath and getting the inspiration for such poems as 'The Belfry of Bruges.' While sailing back he wrote his 'Poems on Slavery,' published late in the year. His gentle nature did not fit him to be a militant poet like Whittier, but his slave lyrics were effective through their sincerity and their metrical and descriptive power.

In July 1843, he married Miss Frances Elizabeth Appleton, of Boston, a beautiful, cultured, and wealthy young woman whom he had met on his second visit to Europe and had portrayed as Mary Ashburton in 'Hyperion.' She bore him children, made his home a hospitable centre, and ministered to him in an ideal way until her tragic death. The next seventeen years formed a period of quiet work and maturing fame. His drama 'The Spanish Student' (1843) was a failure, but 'The Poets and Poetry of Europe' (1845) and 'The Belfry of Bruges and Other Poems' (1846) did him credit, and the beautiful idyll 'Evangeline' (1847) not only won all hearts, but enabled his admirers to proclaim him as an American poet who had succeeded in a fairly elaborate work of art. The not yet naturalized hexameters and the bookish origin of the descriptions have not effectively counteracted the narrative power and the pathos of the story, and 'Evangeline' seems destined to hold its own with readers yet unborn.

Longfellow had already planned a still more elaborate work on which he labored for many years, but which he was never able to make a success. This was 'Christus, a Mystery,' finally completed in 1872, a poem designed to picture Christendom in the apostolic, the mediæval, and the modern periods. The second portion, 'The Golden Legend' (1851) was the part first published and was by far the best. Its pictures of mediæval life have deservedly won high praise, but the general public has remained singularly cold to the merits of the work.

Meanwhile, the duties of his professorship, little onerous though they seem to have been, weighed more and more heavily on Longfellow, who was also troubled with weak eyes, frequent attacks of neuralgia, and the importunities of autograph hunters and other bores. In 1854 he resigned his chair and thenceforth devoted himself entirely to literary work and pleasant social life. His Indian epic 'Hiawatha' (1855), written in the trochaic measure of the Finnish 'Kalevala,' was immediately popular, and three years later in 'The Courtship of Miles Standish,' he reached his highest point as a narrative poet. Excellent though 'Evangeline,' 'The Golden Legend,' and 'Hiawatha' had been, they had, nevertheless, been too plainly the work of a sophisticated poet writing in his library; 'Miles Standish,' dealing as it did with the past of Longfellow's native New England, drew part of its inspiration from the poet's own life and character, moulded as they were by tradition and environment.

During the agitated period which immediately preceded the Civil War Longfellow sympathized with the cause represented by his friend Sumner, but took no active part in the strife. In July 1861 the tragedy of his life came to him late—his wife was burned to death, her light dress having caught fire from a match on the floor. He was practically heart-broken, but bore his bereavement manfully. Taking up a task that had long before interested him, he sought solace in translating the great poem of Dante. With the aid of Lowell and Professor Charles Eliot Norton (q.v.) he completed the work in about five years (published 1867-1870). It ranks with the best of such renderings of great poems into English, though some have questioned whether Longfellow was not more successful in his earlier attempts to translate a poet always dear to him.

Meanwhile, in 1863, he had published his 'Tales of a Wayside Inn,' some portions of which, such as 'The Saga of King Olaf,' were excellent. In 1868 'The New England Tragedies,' the final section of 'Christus,' failed to attract readers, as did also the first section, 'The Divine Tragedy,' which appeared in 1871. In the spring of 1868 he sailed for the last time to Europe and remained over a year, receiving degrees from Oxford and Cambridge and other evidences of the affection and admiration his works had gained for him abroad. The rest of his life was marked only by the appearance of an occasional volume, and by a growing veneration among his countrymen for his character and his genius. Probably the most significant productions of his old age were some of his sonnets and his dignified 'Morituri Salutamus,' delivered at Bowdoin (in 1875) at the semi-centennial of his class. He lived on, declining in health but still preserving the serenity of his disposition, until 24 March 1882, when he died after a short illness. Two years later his bust was placed in the Poets' Corner of Westminster Abbey—for his fame was almost as truly a British as an American possession.

Longfellow is generally admitted to be the most popular of American poets, and the recent celebration of his centenary shows that there has been no real abatement of his countrymen's regard for his character and his works. Naturally, however, he has not escaped censure on the score of the comparatively derivative and facile quality of his genius. Authors of greater individuality, of finer artistic powers and training, of more pronounced national and democratic qualities—Emerson, Poe, Hawthorne, Whitman, for example,—have received higher praise from critics and have aroused in their devotees a more perfervid admiration than has fallen to Longfellow's lot, at least of late years. Waiving comparisons, we may frankly admit that Longfellow did follow, in the main, well-beaten paths, that he was much indebted to the culture of other nations, that he fell short of the higher reaches of the art of poetry, that a considerable proportion of his work is of but slight value. On the other hand, we should insist that nearly all his work, whether in prose or verse, was important in the development of American literature and the American character, that within his limits he was a true and very accomplished artist, that he succeeded in both elaborate and unelaborate forms, that his fame transcended the bounds of his own language, and that, as a narrative poet and a writer of appealing lyrics of sentiment and reflection, he has left a body of work of permanent and individual value. It seems to be hypercritical not to allow the author of 'Flowers,' 'The Building of the Ship,' 'The Bridge,' 'The Day is Done,' and scores of similar lyrics, of such sonnets as the beautiful 'Cross of Snow' (in memory of his second wife), and of such sustained poems as 'Evangeline,' 'The Golden Legend,' 'Hiawatha,' and 'The Courtship of Miles Standish,' the ungrudging praise due to the poet who is both great and essentially good and wholesome.

Longfellow's more important publications have already been named, but to them may be added 'The Seaside and the Fireside' (1850), which contained 'The Building of the Ship'; 'Flower-de-Luce' (1867); 'Aftermath' (1874); 'The Masque of Pandora and Other Poems' (1875), which included 'Morituri Salutamus'; 'Kéramos and Other Poems' (1878); 'Ultima Thule' (1880); 'In the Harbor' (1882); and 'Michael Angelo' (1883). For bibliography see Foley's 'American Authors' and the appendix to E. S. Robertson's memoir in the 'Great Writers' series. A very useful list of authorities is given in C. H. Page's 'Chief American Poets,' pp. 641-642.

Bibliography.—There are good editions of the complete works (*e.g.*, the Riverside in 11 vols.) and of the poems (*e.g.*, Cambridge, 1 vol.). The standard biography is that by Samuel Longfellow (3 vols., 1891—superseding the 'Life,' 2 vols., and 'Final Memorials'). An excellent brief sketch is that by G. R. Carpenter in the 'Beacon Biographies.' The volume in the 'American Men of Letters' is by Col. T. W. Higginson. Consult also W. D. Howells, 'My Literary Friends,' (1900), and Charles Eliot Norton's 'Longfellow' (1907—with poems of an autobiographical character). For criticism consult Stedman's 'Poets of America' and the histories of American literature.

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Longfellow, Samuel, American Unitarian clergyman and poet: b. Portland, Maine, 18 June 1819; d. Cape Elizabeth, Maine, 3 Oct. 1892. He was a younger brother of H. W. Longfellow, and was graduated from Harvard in 1839 and from Harvard Divinity School in 1846. After his ordination to the ministry he was pastor of the Unitarian Church at Fall River, Mass., 1848-51; of the 2d Unitarian Church in Brooklyn, L. I., 1853-60; and of the Unitarian Church at Germantown, Philadelphia, 1877-82. His remaining years were spent in Cambridge. His fame as a poet has been overshadowed by that of his brother, but he had a very distinct poetic gift, and his hymns, of which he wrote many, are among the best of modern religious lyrics.

His published works include: 'A Book of Hymns,' with S. Johnson (1846), a compilation revised in 1864 as 'Hymns of the Spirit'; 'Thalatta: a Book for the Seaside,' with T. W. Higginson (1853), a verse compilation partly original; 'Life of Henry Wadsworth Longfellow' (1886); 'Final Memorials of Henry Wadsworth Longfellow' (1887); 'Essays and Sermons' (1894); 'Hymns and Verses' (1894). Consult: May, 'Memoir and Letters of Samuel Longfellow' (1894).

Longfellow, William Pitt Preble, American architect: b. Portland, Maine, 25 Oct. 1836. He is a nephew of Henry W. Longfellow (q.v.), and was graduated from Harvard in 1855. He was assistant architect of the Treasury Department 1869-72; is a fellow of the American Society of Architects, and was the original editor of 'The American Architect.' He was chairman of the architectural section of the Board of Judges of the World's Columbian Exposition, 1893. He has published: 'Abstract of Letters on Perspective' (1889); 'Cyclopedia of Architecture in Italy, Greece and the Levant' (1895), a work of great value; 'The Column and the Arch' (1899); 'Architectural Essays'; 'Applied Perspective' (1901).

Longicornes, lŏn-jĭ-kôr'nēz, or **Long-horned Beetles.** See CERAMBYCIDÆ.

Longino, Andrew Houston, American lawyer: b. Lawrence County, Miss., 16 May 1855. He was graduated from Mississippi College, Clinton, Miss., in 1876 and until 1880 was clerk of the circuit and chancery courts for Lawrence County. He was elected to the State senate in 1880 and in the following year was admitted to the bar. He served until 1884 in the State senate and was appointed district attorney for southern Mississippi and in 1894 became chancellor. He was elected governor of Mississippi for a term of four years in 1900.

Longinus, Cassius, Athenian Neoplatonic philosopher and rhetorician: b. about 213 A.D.; d. Palmyra, Syria, 273 A.D. Greek literature was the principal subject of his studies. He studied the philosophy of the day under Ammonius Sacas at Alexandria, but subsequently became an ardent adherent of the Platonic philosophy and annually celebrated the birthday of its founder by a banquet. He afterward visited the East, and on the invitation of Queen Zenobia went to Palmyra to instruct her in Greek learning and to educate her children. On the death of her husband he was employed by her in the administration of the state, and advised her to throw off the Roman yoke, by which means he was involved in the fate of this queen. For when Zenobia was taken prisoner by the Emperor Aurelian, and could save her life only by betraying her counsellors, Longinus, as the chief of them, was seized and beheaded 273 A.D. He suffered death with all the firmness of a philosopher. He was distinguished by his oratory as well as his statesmanship and love of liberty. He appears to have known Latin and Syriac as well as Greek. The work known as 'Longinus on the Sublime,' the best piece of literary criticism in the Greek language, was written either by him or by a certain Dionysius Longinus, whose date is the 1st century after Christ.

Longitude, lŏn'jĭ-tūd, of a heavenly body, is the angle between two planes, both of which are at right angles to the ecliptic, and pass through the sun (heliocentric longitude), or through the earth (geocentric longitude). The longitude of a place on the earth is the angle between the meridian through the place and some fixed meridian. At the Geodetic Congress held in 1884 at Washington, and composed of scientific representatives from the principal countries of the world, it was resolved to adopt the meridian of Greenwich as the universal prime or first meridian, the representatives of France being the only important objectors. Longitude, or the angle between two meridians, may be measured by the arc of the equator, or of any parallel intercepted between them. As the parallels get smaller toward the poles, it is evident that degrees of longitude which are 69½ statute miles long at the equator get shorter toward the poles. At all places of the same latitude the length of a longitude degree (measured due east and west) is the same. All methods of determining longitude are based on this fact. (1) A method formerly employed to determine the difference in longitude between two land stations was to carry chronometers backward and forward a number of times from one place to the other until the effects of variation of rate had been eliminated; comparison of their indications with the sidereal times at the places gave the longitude. (2) A ship carries a chronometer indicating Greenwich time; the local time at any place is known from observation of the sun, hence the longitude of the place may be calculated. (3) The Nautical Almanac gives the Greenwich time at which the moon is at certain distances from certain stars; mariners note the local time at which the moon is at the same distances from these stars (they are aware of the local time from observation of the sun in the daytime), and so the longitude is known. (4) The eclipses of Jupiter's satellites are seen by all observers on the earth at the same instant; their Greenwich times being noted in the Nautical Almanac, and their local times being observed as in method (3), the difference in time from Greenwich is known. The tables of these eclipses are not yet complete enough for this method to be in great use. Observations of lunar transits and the occultation of fixed stars afford other means of determining longitude. See also LATITUDE.

Longley, James Wilberforce, Canadian politician: b. Paradise, Nova Scotia, 4 Jan. 1849. He was educated at Acadia College, N. S., studied law in Halifax and was called to the bar in 1875, becoming Queen's Counsel in 1890. He was chief editorial writer for the 'Acadian Recorder' 1873-87, and was managing editor of the Halifax *Morning Chronicle* (1887-91). Since 1882 he has been a member of Nova Scotia Assembly and in 1886 was made attorney-general. He materially assisted the passage of the bill for the abolition of imprisonment for debt.

Long'mans, London publishers for many years identified with high-class literature. Thomas Longman (1699-1755) was apprenticed to John Osborne, bookseller, Lombard Street. Longman bought the business of William Taylor, publisher of 'Robinson Crusoe,' conducted in Paternoster Row, whence he moved in 1726 to the present site. Longman was a shareholder in many important publications, such as Boyle's 'Works,' Ainsworth's 'Latin Dictionary,' Chambers' 'Cyclopedia,' and Johnson's 'Dictionary.' His nephew and successor, Thomas Longman (1731-97), published a new edition of Chambers'. With Thomas Norton Longman (1771-1842) the firm reached a high degree of literary and commercial prosperity. Lindley Murray's 'Grammar' was published and proved valuable, while the firm had literary connection with Wordsworth, Southey, Coleridge, Scott, Moore (to whom it paid £3,000 for 'Lalla Rookh'), Sidney Smith, and other leading authors. In 1826 the 'Edinburgh Review' became the property of Longmans. The next important members of the firm were Thomas Longman (1804-79), the eldest son of T. N. Longman who issued a beautifully illustrated New Testament, and William Longman (1813-77), the third son, who wrote 'Lectures on the History of England' (1859); 'History of the Life and Times of Edward III.' (1869); and 'History of the Three Cathedrals of St. Paul' (1873). The events of this generation were the publication in succession of Macaulay's 'Lays of Ancient Rome' (1842); 'Essays' (1843); and 'History.' The famous check for £20,000 paid to Macaulay as his share of the profits of the 3d and 4th volumes for the first few months (1855) is still preserved. The partners of the fifth generation were Thomas Norton Longman and George Henry Longman, sons of Thomas Longman, and Charles James Longman and H. H. Longman, sons of William Longman. One of the earliest ventures of this time was Disraeli's 'Endymion,' for which the author received £10,000. Lord Beaconsfield's other works had come into possession of the firm in 1870, when they published his 'Lothair.' A magazine —'Longman's'— was also established by the house.

Longobardi, lŏn-gō-bär'dī. See LOMBARDS.

Long's Peak, one of the highest elevations of the Rocky Mountains, in Colorado, about 48 miles northwest of Denver. Its height is 14,271 feet. It was named in honor of Col. Stephen Harriman Long (q.v.).

Long'spurs, a group of large finches, typically of the genus *Calcarius*, distinguished by the great size of the claw of the hind toe. All are northern birds, frequenting open lands and inclined to form into flocks. The Lapland longspur (*C. lapponicus*) is known throughout the northern parts of Europe and Asia as well as America, and breeds only in the extreme north, coming south of the area of deep snow in winter, but always rare and irregular in the United States. Three other species are restricted to

North America, one of which, the chestnut-collared (*L. ornatus*) is well-known in the West, as it breeds abundantly on the plains of Dakota and Montana, making its nest on the ground. All are handsome birds, with a mixture of colors, in which black, chestnut, red and buff are conspicuous. Detailed descriptions of all may be found in Dr. Coues' 'Birds of the Northwest' (1874).

Long'street, Augustus Baldwin, son of William Longstreet (q.v.), American jurist and author: b. Augusta, Ga., 22 Sept. 1790; d. Oxford, Miss., 9 Sept. 1870. He was graduated at Yale College in 1813, began the study of law at Litchfield, Conn., and was admitted to practice in Georgia in 1815. In 1821 he represented the county of Greene in the legislature, and in 1822 was made judge of the superior court of Ocmulgee circuit. Declining re-election to the bench, he returned to the bar, and was especially distinguished for his efforts and successes in criminal cases. In 1822 he removed to Augusta, Ga., and founded the 'Sentinel.' In 1838 he entered the ministry of the Methodist church, and was president of Emory College 1839–48 and subsequently of the University of Mississippi. His works include: 'Georgia Scenes,' a series of broadly humorous sketches, long popular (1840); 'Letters From Georgia to Massachusetts.'

Longstreet, James, American soldier: b. in Edgefield district, S. C., 8 Jan. 1821; d. Gainesville, Ga., 2 Jan. 1904. He was graduated at the United States Military Academy in 1842; entered the army as lieutenant of infantry and, after performing duty at various Western posts, served in the Mexican War, in which (at Chapultepec) he was badly wounded and for gallantry in which he received the brevets of captain and major. From 1847 to 1852 he was stationed on the Texas frontier and in 1858 became paymaster with the rank of major. In June 1861, the Civil War having broken out, he resigned from the United States army and entered that of the Confederacy as a brigadier-general. At the first battle of Bull Run (q.v.) he commanded a brigade, and in 1862 was made a major-general. In the retreat before McClellan, during the Peninsular campaign (q.v.) he was in command of Gen. J. E. Johnston's rear guard, and contributed greatly to the safe withdrawal of the main army to Richmond. In the Seven Days' Battles (q.v.) he fought with credit to himself and his division, whose losses were very heavy; and at the second battle of Bull Run (q.v.) he displayed promptness, energy, and generalship to which the Confederate victory was largely attributed. He commanded the right wing at Antietam, and at the battle of Fredericksburg (q.v.) had command of the left, repulsing the desperate assault of Burnside's army. After Fredericksburg he was made lieutenant-general, and with that rank commanded one of the three corps of the Confederate army of invasion, known as the Army of Northern Virginia. At the battle of Gettysburg (q.v.) during the second and third days, he commanded the right wing, which sustained the chief burden of the conflict, furnishing the columns that made Pickett's charge. Transferred to the Army of Tennessee, Longstreet arrived on the field in time to save the day at the battle of Chickamauga (q.v.). He next moved unsuccessfully against Burnside at Knoxville (q.v.) and early in 1864 rejoined General Lee in Virginia. Again distinguishing himself in the battles of the Wilderness, he was severely wounded and for some months disabled, but was in command of the First corps of the Army of Northern Virginia during the later months of 1864 and took some further part in active field-service, retaining to the last his distinction as a general and a fighter, and coming out of the war at its close with the respect of the whole country, which has never diminished. After the war he engaged in business in New Orleans and, having become a Republican in politics, was surveyor of customs at that port, 1869–73. In the same city he was afterward postmaster. He removed to Georgia in 1875; was United States minister to Turkey, 1880–1; in 1881–4 served as United States marshal of Georgia, and was appointed United States railway commissioner in 1898. He has written for periodicals, and has published 'From Manassas to Appomattox' (1896).

Longstreet, William, American inventor: b. New Jersey 1760; d. Georgia 1814. He settled in Augusta, Ga., in early life and on 26 Sept. 1790 wrote a letter to Thomas Telfair of Savannah asking his assistance in raising the means to construct a boat to be propelled by steam. This letter was published in the Savannah and Augusta newspapers, but funds were not immediately obtained, though he stated his entire confidence in the success of the scheme. He was subsequently furnished with the necessary means for experiment, and constructed a small model boat, upon a plan very different from Fulton's, which went on the Savannah River against the stream at the rate of five miles an hour. Cotton had previously been ginned by two rollers, not quite one inch in diameter, which caught the fibres, pressed out the seed, and delivered the clean cotton on the other side, where it was taken by the ginner's hand, and deposited in a bag attached to his person. Longstreet invented and patented the "breast roller," moved by horse power, which entirely superseded the old method. The inventor set up two of his gins in Augusta, which were propelled by steam, worked admirably, and promised him a fortune. They were, however, destroyed by fire within a week. He next erected a set of steam mills near St. Mary's, Ga., which were destroyed by the British in an invasion in the War of 1812. These disasters exhausted his resources and discouraged his enterprise, though he was confident that steam would soon supersede all other motive powers.

Longueuil, lŏṅ-gėl, Canada, town, in Chambly County, in the province of Quebec; on the Saint Lawrence River, and on the Canadian Pacific railroad. It is situated opposite Hochelaga, the northeastern part of Montreal. Longueuil is a residential suburb of Montreal, the country around contains many summer homes of city residents. It has Saint Anthony's orphanage and an academy for girls and one for boys.

Longueville, Anne Geneviève de Bourbon Condé, ăn zhĕn-vē-ĕv dė boor-bôṅ kŏn-dā lŏṅg-vēl, DUCHESS OF, French beauty and politician: b. Vincennes 29 Aug. 1619; d. Paris 15 April 1679. Her father, Henry II., prince of Condé, was prisoner in the chateau of Vincennes at the time of her birth. Her brothers were the great Condé and the Prince of Conti. The Prince de Joinville, to whom she had been betrothed, having died, she married in 1642 the Duke de Longueville, a widower double her age. Imbibing a fondness for politics, she displayed it most actively in the part which she took in the Fronde. In order to punish the duchess, her brothers and husband were arrested by order of Anne of Austria, the regent, in 1650; but she persisted in her resistance to the court, and repaired to the citadel of Stenay in Flanders, of which she took the command, and was able to induce Turenne to join the Fronde. After the peace of 1659 she devoted herself to a religious life and her influence in Rome was said to have secured for the Jansenists the so-called peace of Clement IX. (1668). The later part of her life was spent in the Carmelite convent of Paris in most stringent observance of religious duties. Cousin, in his ‘Madame de Longueville’ (6th ed., 1859), calls her «the soul of the Fronde.»

Longus, lŏng′gŭs, Greek writer, supposed to have lived about the close of the 4th or the beginning of the 5th century A.D. Concerning his history nothing is known. He was the author of a pastoral romance entitled ‘The Pastorals of Daphnis and Chloe,’ of which the best editions are those of Villoison (1778), Courier (1810), Passow (1811). Longus is the latest of the bucolic poets and in the Renaissance period was widely read, his pastoral descriptions, as given in Amyot's French translation, having not a little to do with the revival of the pastoral form.

Long′view, Texas, town, county-seat of Gregg County; on the Texas & P., the Texas, S. V. & N., and the Great N. R.R.'s; about 240 miles northeast of Austin and 120 miles east of Dallas. It is situated in an agricultural section, in which are raised large crops of grain and cotton. The chief manufacturing establishments are foundry, lumber-mills, railroad-shops, cottonseed-oil mills, and plow-works. The principal offices of the Texas, Sabine Valley & Northwestern railroad are in Longview. The trade is principally in agricultural products, live stock, hides, cottonseed-oil, and lumber. Pop. (1890) 2,034; (1900) 3,591; (1910) 5,155.

Long′worth, Nicholas, American wine manufacturer and horticulturist: b. Newark, N. J., 16 Jan. 1782; d. 1863. At 21 he went to the then unimportant settlement of Cincinnati, where he studied law. After 25 years' experience at the bar he retired from professional life in order to devote himself to the cultivation of the grape, with a view of manufacturing wine. At first his efforts were unsuccessful from his having adopted the erroneous notion of the early American vine growers, that foreign plants were alone to be relied upon. He had imported many different species from every vine-growing country in Europe before trying those indigenous to the United States. About 1828 he commenced the experiment, and became a high authority in vine culture, being not infrequently called the «Father of American Grape Culture.»

Lönnrot, lĕn′rŏt, **Elias,** Finnish philologist: b. Sammatti, in Nyland, 9 April 1802; d. there 19 March 1884. Recognizing the value of the people's songs and ballads for Finnish language study, he spent years in collecting such material in Finland, Lapland, and adjoining provinces, and published the fruits of his researches in a series of volumes. Among his «finds» is to be numbered the great popular epic ‘Kalevala,’ of which only a few cantos were previously known to the learned world. He wrote a ‘Finnish-Swedish Dictionary’ (1866–80). See KALEVALA.

Loo (short for lanterloo, from the Dutch name), a game of cards played with five (sometimes three) cards, dealt from a whole pack, either by threes and twos, or one at a time. After dealing, a card is turned up for trumps. The jack of clubs, or the jack of the trump suit, as agreed on, is the highest card, styled «pam»; the ace of trumps is next, and then the other cards as in whist. Five cards of a suit, or four with «pam,» compose a «flush,» which sweeps the board, and yields only to a superior flush, or the elder hand. When the ace of trumps is led, it is usual to say, «Pam be civil»; the holder of the jack (of trumps or clubs; see above) is then expected to let the ace pass. Each player has the liberty of changing his cards for others from the pack, or of throwing up the hand, in order to escape being looed, that is, failure to gain a trick. All those that win tricks divide the pool or «loo,» to which on entering the game each player contributes chips (usually three) in proportion to the tricks taken. Every player who is looed must again contribute a stake, which, with the dealer's stake, forms a new pool.

Loo-choo Islands. See LIU-KIU ISLANDS.

Loo′fah, Egyptian, the fibrous portion of the fruit of one or two species of the genus *Luffa* of the gourd family, sold for use as a bath-sponge or flesh-rubber. There are about 10 species of the genus known, but the «towel gourd,» as this bath-sponge is sometimes called, appears to be obtained chiefly from *L. ægyptiaca.* In the West Indies the fruit of *L. acutangula* yields a similar network of fibres, and is there used as a sponge or dishcloth, and worked up into baskets and small ornamental articles.

Looking Backward, 2000-1887, a romance by Edward Bellamy, published in 1888. It had a sale of nearly 400,000 copies in the next ten years, and is still in demand. It recounts the strange experiences of Julian West, born in 1857, who in 1887 is put into a hypnotic sleep. In the year 2000, Dr. Leete, a retired physician, is conducting excavations in his garden, when West's subterranean chamber is disclosed. The doctor discovers and resuscitates the young man, who finds himself in a regenerated world.

Lookout Mountain. See CHATTANOOGA, BATTLE OF.

Loom, a term originally meaning simply «tool,» but now particularized so as to apply to a machine for weaving. The simplest form of the loom, still in use among semi-primitive tribes and up to the middle of the 18th century practically the only form, was the hand loom, a rectangular frame, from one side of which yarn is stretched to the opposite side, where it is so secured that the transverse threads may be passed by hand «over and under» the threads already stretched. Fig. 1

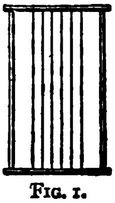


FIG. 1.

shows the simplest form of this loom. The form in commoner use in civilization up to Cartwright's invention of the power loom in 1785 is merely this same actual frame set in a skeleton box (AAAA) in a horizontal position (Fig. 2). The end pieces of the actual frame are now rollers, so that the length of the piece of cloth is no longer necessarily less than the length of the frame. These rollers are the beam or yarn-roll (B), which is at the back of the loom, and upon which the warp threads are wound, and the cloth beam (C) to which the threads are fastened and which winds up the cloth as it is made. The threads of the warp, held tight by weights (b, b), pass through the eyes of the heddles (or healds), thus being separated to permit of the passage of the shuttle, and also through the reed. The shuttle in the hand-loom is thrown by the operator, and in the power loom by the picker-staff machinery; in either case it is made of hard wood, is pointed at either end and carries in a recess the quill or bobbin.

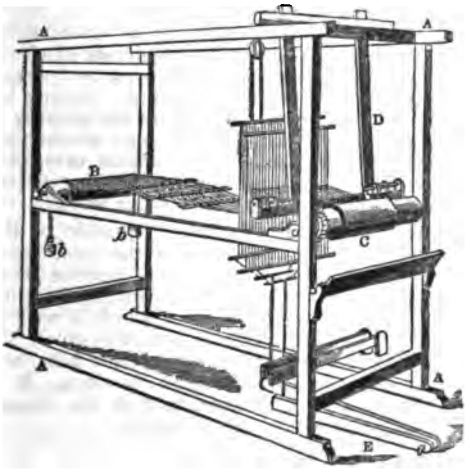


FIG. 2.

This hand-loom was first successfully improved, after the unfortunate attempts of De Gennes in 1678, by Edmund Cartwright, who undertook in 1785 to counterfeit by mechanical means the three simple motions of weaving. He had neither mechanical nor textile training, but his loom though cumbrous and awkward is essentially that now in use. The simplest modern loom differs essentially from the hand loom in that the warp yarn is no longer stretched direct from the yarn roll to the cloth beam, and these two parts are no longer placed at the same height from the base of the frame nor at so great a distance as before. The yarn runs upward from the warp-beam over the whip-roll, thence is carried through heald, heddle, or (the American term) harness, and through the reed, and down from the latter to the cloth roll. The advantage of this arrangement is greater stability and a distinct saving in space, the depth of the loom being materially decreased. With the old fashioned heddle only the simplest and most regular webs could be woven; for figured patterns the most effective mechanism is the Jacquard attachment, patented by a weaver of Lyons, Joseph Marie Jacquard, in 1801. This machine lends itself readily to use with any loom. It may be described as a means of forming the shed and governing the heddle,— in fine, it takes the place of the weaver's fingers. A revolving drum or cylinder is so perforated as to catch some or all needles, which in turn govern a set of perpendicular hooks. These hooks guide the threads of the warp, so that the weaving is no longer of necessity simply «under or over.» How many threads are to be skipped is determined by a perforated card-board, the perforations occurring where the thread of the warp is to lie above the filling; but if the warp-threads are not to be raised no holes are cut in the cards, the needles do not enter the cylinder, and the hook attached to the needle does not lift, by means of its neck-cord or loop of twine, the thread of the warp. A series of these cards, each with different perforations, makes an almost infinite combination of patterns possible, as each card makes a different shed.

The hand loom is still used for the manufacture of rugs and fine carpets, but the power loom, driven by various powers, electricity being the latest and in some ways the most economical, is used for almost any purpose. The ribbon-loom, for instance, weaves simultaneously a number of narrow pieces. Many attachments, invented in a long series, have continuously and wonderfully decreased the need of any supervision of the loom, making it more and more automatic: thus a shuttle protector automatically stops the machinery if the shuttle fails to fly all the way across the warp; the filling stop motion protects the machinery from running on uselessly when the filling breaks or runs out; and take-up, let-off, and warp-stop motions are further automatic devices. The highest pitch of automatic attachment is the Northrop patent, which is a hopper full of loaded bobbins; these are fed into the place of the empty bobbins as soon as the yarn is exhausted.

See Posselt, 'Textile Machinery' (1901) and 'Jacquard Machine Analyzed and Explained' (1893); and Barlow, 'History and Principles of Weaving by Hand and by Power' (1879).

Loo'mis, Alfred Lebbeus, American physician: b. Bennington, Vt., in 1833; d. 23 Jan. 1895. He was graduated at Union College in 1851, and studied medicine in New York city at the College of Physicians and Surgeons, where he was graduated in 1852. He gave his attention to diseases of the lungs at a time when auscultation and percussion were acquiring great scientific importance in medical practice, and in the treatment of such diseases became an efficient specialist. In 1859 he was appointed visiting physician to Bellevue Hospital, New York, and was made lecturer on physical diagnosis at the College of Physicians and Surgeons in 1862. Having spent some months in the Adirondack Mountains for the improvement of his health, in later years he established the Sanitarium at Saranac and the Hospital for Consumptives at Liberty, N. Y. In 1866 he accepted the professorship of theory and practice of medicine at the University of the City of New York, remaining in connection with that institution until his death. The work done by him for its medical department was of great and lasting importance, as were also the services he rendered to the New York Academy of Medicine. In 1874 he was appointed visiting physician to Mount Sinai Hospital; was president of the New York Academy of Medicine, 1899–90 and 1891–2. His publications include 'Lessons in Physical Diagnosis’ (1870); ‘Lectures on Fevers’ (1877); and ‘A Text-book of Practical Medicine’ (1884). He also edited ‘An American System of Medicine’ (1894).

Loomis, Charles Battell, American humorist: b. Brooklyn, N. Y., 16 Sept. 1861. He was educated at the Brooklyn Polytechnic Institute and held a business clerkship 1879–91. He is a frequent contributor to periodicals and has published ‘Just Rhymes’ (1899); ‘The Four-Masted Cat-boat’ (1899); ‘Yankee Enchantments’ (1900); ‘A Partnership in ‘Magic’ (1903).

Loomis, Chester, American painter: b. near Syracuse, N. Y., 18 Oct. 1852. He was educated at Cornell University (1868–71); studied painting at Paris under Léon Bonnat, and after a residence of 11 years in France opened a studio at Englewood, N. J. He is favorably known as a figure and landscape painter and his pictures are found in many private collections. His ‘Christopher Sly’ was awarded a gold medal at the Massachusetts Charitable and Mechanics’ Institution Exhibition and was subsequently purchased by the Indianapolis Art Association.

Loomis, Elias, American physicist: b. Willington, Conn., 7 Aug. 1811; d. New Haven, Conn., 15 Aug. 1899. He was graduated at Yale College in 1830, and was tutor there in 1833–6. He was the first person in America to obtain a view of Halley’s comet, at its return in August 1835, and his observations on that body, with a computation of its orbit, were published in the ‘American Journal of Science.’ After a year’s study in Paris he was professor (1837–44) of mathematics in Western Reserve College, Ohio, of natural philosophy (1844–60) in the University of New York, and of natural philosophy and astronomy (from 1860) at Yale. He devoted much of his time to original research, wrote more than 100 scientific treatises, and published a series of text-books on mathematics, natural philosophy, astronomy, and meteorology, of which more than 500,000 copies were sold. Among his publications were: ‘Elements of Algebra’; ‘Elements of Geometry and Conic Sections’; ‘Recent Progress in Astronomy.’

Loomis, Francis B., American journalist and diplomatist: b. Marietta, Ohio, 27 July 1861. He was a graduate from Marietta College, and in 1883 joined the staff of the New York *Tribune.* He was state librarian of Ohio 1885–7; consul at St. Etienne, France, 1890–3, and editor-in-chief of the Cincinnati *Daily Tribune* 1893–6. He was United States envoy-extraordinary and minister plenipotentiary to Venezuela, 1897–1901, and while there was active in promoting the interests of American commerce in South America. He filled the same diplomatic position at the court of Portugal 1901–03, and became assistant secretary of state in January 1903, but resigned in 1905.

Loomis, Gustavus, American soldier: b. Thetford, Vt., 1789; d. 1872. He was graduated at West Point and received his commission as sub-lieutenant of artillery in 1811. He saw service on the Niagara frontier from 1812 to 1813, in which latter year he took part in the capture of Fort George (May 27) and was made prisoner the following December at Fort Niagara. During the war with Great Britain, the Black Hawk war, and the campaign against the Seminole Indians, he held important commands, and after the Civil War, in which he served as superintendent of the general recruiting service, was retired with rank as colonel of infantry. In 1865 he received the brevet of brigadier-general of the United States army.

Loomis, Lafayette Charles, American author and educator: b. North Coventry, Conn., 7 July 1824; d. 1906. He was graduated from Wesleyan University, Conn., in 1844, and was successively president of colleges at Wilmington, Del., and Wheeling, W. Va., and later medical professor at Howard University, Washington, D. C. He published ‘Mizpah’ (1859); ‘Mental and Social Culture’ (1868); ‘Index Guide to Travel and Art Culture in Europe’ (1880); ‘Myself’ (1894).

Loomis, Silas Lawrence, American scientist and inventor: b. Coventry, Conn., 1822. He was graduated from Wesleyan University in 1844, from the medical school of Georgetown University in 1856, and was professor of physiology at Georgetown in 1859–60. In 1857 he was appointed astronomer to the United States coast survey, in 1860 instructor in mathematics to naval cadets, in 1861–7 was professor of chemistry and toxicology at Georgetown, and subsequetly occupied a chair at Harvard. Among his inventions are a process for manufacturing a textile fabric from the palmetto, and another for making profitable use of chromium ores. He wrote text-books of arithmetic, a ‘Key to the Normal Course’ (1867), and other works.

Loon, lō-ōn′, Philippines, a pueblo of the province of Bohol, situated on the west coast, 13 miles north of Tagbiliran, and opposite Dalaguete, Cebu. A mole 328 yards long, protecting the harbor, extends to the town, which is reached by steps cut in the rock. It is picturesquely situated on the slope of the Cammanoc hills, and has on old Spanish fort with bastions. It is centrally located for trade, and is the largest town in the province. Pop. 15,400.

Loon. See Diver.

Loos, lōs, **Charles Louis,** American educator: b. Woerth-sur-Sauer, Basse-Alsace, France, 23 Dec. 1823. He came to the United States in 1832, and settled at New Franklin, Ohio, where he studied English, became connected with the Disciples of Christ in 1858 and preached at 17. He was graduated from Bethany College in 1846, where he was professor of ancient languages 1858–80. He was president of Kentucky University 1880–97. In 1849 he was ordained to the ministry of the Disciples and has been of great prominence in his denomination.

Loose′strife, a plant of the genus *Lysimachia,* of the primrose family, about 40 species of which grow in the temperate zone. Several yellow-flowered species belong to the United States, but those best known are the whorled or four-leaved (*L. quadrifolia*), and the bulb-bearing, *L. terrestris.* Two or three species, especially *L. nummularia,* popularly known as moneywort, creeping Charley and creeping Jenny, have been introduced from Europe. One kind is eaten in India as a pot-herb with fish. «Again and again,» says Miss Lounsberry, in her ‘Southern Wild Flowers and Trees,’ «we come across the loosestrifes during our summer and early autumn rambles. And soon we learn to associate with them their opposite, or whorled, leaves, always entire, and their upright, rather stiff manner of growth, and very frequently we look for their petals to be darkly spotted near the bases. In personality the genus reminds us somewhat of the St. John's-wort, but we think of the latter as being usually freer, more prolific bloomers. The old and pretty legend concerning our present plants is that they loose strife; that they act as peace-makers especially among cattle that are quarrelsome. Believing this, people in the old country used to tie such a spray to their yokes before starting out on a long journey.»

The name loosestrife is also given to species of the genus *Lythrum*, which some botanists place in the order *Primulaceæ*, of which about a dozen species are widely distributed in temperate climates. They are characterized by four-angled stems, usually opposite leaves which are sometimes whorled, and reddish-purple or white flowers, solitary above and whorled lower down the stems. Some are cultivated for ornament in borders and among shrubbery, where they succeed well. The best-known species is the purple loosestrife (*L. silicaria*), which is frequently planted.

Lope de Vega, lō pā dā vā'gā. See Vega, Carpio.

Lopes, lō'pāsh, **Caetano,** Brazilian historian: b. Bahia October 1780; d. Paris 22 Dec. 1860. He was a mulatto and after obtaining an education in Bahia and Paris, France, settled in the latter place in 1822 and became corresponding member of the Academy of Inscriptions and Belles-lettres. The Emperor Pedro held him in high esteem and the Historical Institute of Rio Janeiro bestowed him its gold medal. He was conspicuous for brightness of style and purity of language. His works, which are numerous, treat of history, biography, and surgery.

Lopes, or **Lopez, Fernao,** Portuguese chronicler: b. about 1380; d. after 1459. He was appointed chief archivist of the kingdom by Dom Joao I. in 1434, and spent his life in historical research and the composition of chronicles, which for literary and critical value were unsurpassed in his century. His 'Chronicle of Señor Don John I.,' describing the great struggle between Portugal and Castile, invites comparison with Froissart's chronicle on account of its picturesqueness and dramatic reality. Equally vigorous are his chronicles of Dom Pedro I. and Don Fernando.

Lopez, lō'pāz or lō'pāth, **Carlos Antonio,** President of Paraguay: b. near Asuncion about 1795; d. there 19 Sept. 1862. He was educated in Asuncion and became noted for his legal acquirements. After the death of President Francia, in 1840, he was secretary of the junta which controlled Paraguay for a few years. In March 1844 the Paraguay congress adopted the constitution he had drawn up and elected him president of Paraguay for ten years. He was reelected for three years in 1851; and again in 1857 for seven. He followed Francia's policy in the main and became involved in quarrels with foreign nations. In 1859 the United States sent a naval force to the Plata to enforce demands against him. He offered to submit the question of damages to arbitration, but afterward evaded the claim.

Lopez, Francisco Solano, Paraguayan president: b. Asuncion 24 July 1827; d. near the Aquidaban 1 March 1870. He was the son of Carlos Antonio Lopez (q.v.), then president. In his 18th year his father made him a brigadier-general in the war against Rosas, the dictator of Buenos Ayres. He afterward filled some of the principal offices of state, and was sent to Europe in 1853, accredited to the chief courts there. In 1855 he returned to Paraguay, became minister of war, and on the death of his father, in 1862, president for ten years. He had aimed at the foundation of a great inland empire, and as his military preparations were now complete, and his army superior to that of any of the South American states, he began hostilities against Brazil in 1864. The Argentine Republic and Uruguay allied themselves with Brazil, and after five years' conflict Lopez was reduced to extremities, and was finally surprised on the banks of the Aquidaban by a troop of Brazilian cavalry and slain. The latter part of his career had been stained by many cruelties and wanton murders. Consult: Thompson, 'The War in Paraguay' (1869); Masterman, 'Seven Eventful Years in Paraguay' (1869); Burton, 'Letters from the Battle Fields of Paraguay' (1871); Washburn, 'History of Paraguay' (1871); Schneider, 'Der Krieg der Triple-Allianz' (1872–5).

Lopez, José Hilario, hō-sā' hē-lä'rē-ō, Colombian politician: b. Popayan 18 Feb. 1798; d. Neiva 27 Nov. 1869. He was president of New Granada (Colombia) from 7 March 1849 to 7 March 1852, and in the last named year slavery was abolished and changes were made looking to the formation of a federal government. In the revolutions of 1854 and 1859–62, he fought with the Federalists and was commander-in-chief for part of this period. He was a member of the provisional government 1862–3, and subsequently President of Tolima. In 1867 he was named commander-in-chief of the army.

Lopez, Narciso, Cuban revolutionist: b. Venezuela 1799; d. Havana, Cuba, 1 Sept. 1851. He served for some time in the Spanish army, from which he retired in 1822 with the rank of colonel. After the evacuation of Venezuela by the Spanish troops, he established himself in Cuba, and afterward during a stay at Madrid joined the party of Isabella against Don Carlos, and became successively adjutant of Valdes, governor of the Spanish capital, and senator for Seville, but threw up his offices after the refusal of the Cortes to admit the representatives of Cuba. Valdes became governor-general of that island, and Lopez on returning thither was employed by him in various capacities. He was soon absorbed by the project of throwing off the yoke of Spain, and he proceeded in 1849 to the United States, where he sunk almost his whole fortune in the organization of three successive expeditions to Cuba: the so-called Round island expedition in 1849; the «invasion of Cardenas» expedition in May 1850, both of which failed, and the Bahia-Honda expedition, of August 1851, which ended fatally. Lopez, with several hundred persons of different nationalities whom he had enlisted in various parts of the United States, landed at Morillo, near Havana, where he left 200 of his men under the command of Colonel Crittenden, who were taken by the

Spaniards and shot. Lopez went to Las Pozas, where he succeeded in repelling an attack of the Spanish soldiers; but, isolated from his friends, sought refuge in the mountains, where he was captured and taken to Havana. He was sentenced to death, which he met with great firmness.

Lopez, Vicente Fidel, Argentine historian: b. Buenos Ayres 1814. He is a son of Vicente Lopez y Planes (q.v.). He became rector of the University of Buenos Ayres and has published ‹Razas del Perú anteriores a la Conquista›; ‹Historia de la Republica Argentina›; ‹Tratado de Derecho Romano›; etc.

Lopez, Cape. See Cape Lopez.

Lopez de Ayala, Pedro, pä'drō, Spanish **ardo,** Spanish dramatist: b. Seville district 1 May 1828; d. Madrid 30 Jan. 1879. He was educated at the University of Seville, and at Madrid in 1851 had his first drama, ‹El Hombre de Estado,› produced. In 1857 he was elected deputy from Badajoz to the Cortes, and subsequently he was a member of Alfonso XII.'s first cabinet. He was the author of numerous lyrics which take excellent rank in Spanish literature, especially of the ‹Epístola.› But he was better known as a dramatist of high literary and popular success. Chief of his plays are ‹Tanto por Ciento› (So Much per Cent), which was recognized by the bestowal upon him of a gold crown, and ‹Consuelo.› Both are searching arraignments of the principles of modern life.

Lopez de Ayala, Pedro, pä'drō, Spanish poet: b. Murcia 1332; d. Calahorra 1407. He served well Henry II., John I., and Henry III., kings of Castile, attained the highest dignities, including those of lord chancellor and high chamberlain of Castile, and wrote the ‹Cronicas de los Reyes de Castilla› (‹Chronicles of the Kings of Castile›) (1780), which covers the period from King Peter to Henry III. In this work he strove to substitute for the dry record of the historiographers a pragmatic account of historical events. He also wrote lyrics, and the ‹Rimado de Palacio› (‹Rime of the Palace›), a satiric poem on political and social questions.

Lopez y Planes, lō'pāz or lō'pāth ē plä'nĕs, **Vicente,** Argentine poet: b. Buenos Ayres 1784; d. there 1856. He was prominent as a soldier and politician, was member of Congress, 1819–25, and provisional president of the republic, 5 July to 13 Aug. 1827. He presided over the supreme court of justice, and was governor of the province of Buenos Ayres. He was the author of the ‹Argentine National Hymn› and other poems.

Lophi'odon, an extinct tapir-like animal, found in the Eocene fresh-water deposits of central Europe. The genus is typical of a family (*Lophisdontidæ*) which includes also the genera *Hyracotherium, Hyrachus, Systemodon* and *Orohippus,* and is a very generalized group probably ancestral to the rhinoceroses. Consult Woodward, ‹Vertebrate Paleontology› (1898).

Lophobranchii, lō-fō-brang'kĭ-ī, a suborder of bony fishes, including the «sea-horses» and «pipe-fishes» (*Syngnathidæ*). See Ichthyology.

Loquat lō'kwat, or **Japan Plum,** a shrub or small tree (*Eriobotrya japonica*) of the natural order *Rosaceæ.* It attains heights of about 10 feet, bears thick evergreen leaves near the ends of the branches, and fragrant, woolly, whitish flowers in terminal panicles in late summer and autumn, followed by downy yellow oval or pyriform fruits (pomes) which ripen in very early spring. The fruits, which in favorable climates are borne in profusion, are highly esteemed for their sub-acid flesh and their pleasantly flavored seeds, the former being used as a dessert, the latter for flavoring cookery. The tree is a native of Japan and China, whence it has been taken to subtropical climates throughout the world. In the Gulf States and in California it is widely popular as a home fruit, though it appears in northern markets. In California several highly improved varieties were produced during the closing decade of the last century. In the north it is often grown in conservatories.

Lorain, lō-rān', Ohio, city, in Lorain County; on the south shore of Lake Erie, at the mouth of the Black River, and on the New York C. & St. L. (Nickel Plate), Baltimore & O., and Lake Erie & Pittsburg R.R.'s; about 26 miles west of Cleveland. The first permanent settlement was made in 1822 by Barney Meeker. It was incorporated as a village in 1873 and as a city in 1895. It is an agricultural and natural-gas region, and is a shipping port for farm products, for the output of the Central Ohio coal fields, and for the lumber and iron ore of a large section of the State. The chief industries of the city are ship-building, coal shipping, manufacturing steel, general manufacturing, and fishing. The Lorain Steel Company employ about 4,000 people; the American Shipbuilding Company, 1,300; the Baltimore & Ohio, in shops, at docks, etc., 1,000; small industries, about 2,000. The city has excellent public and parish schools, a public library, 22 churches, and Saint Joseph's Hospital. There are five banks with a combined capital of $300,000. The annual amount of business is about $2,500,000. About 75 per cent. of the inhabitants are American born. The government is vested in a mayor, a board of public service (three members), and a council of seven members. Four of the council are elected one from each ward, and the other three, at large. The board of education, waterworks trustees, and marshal are chosen by popular election; the board of health are chosen by the council; the police are appointed by the mayor subject to approval by the council. The waterworks are owned and operated by the city. Pop. (1900) 16,028; (1910) 28,883. F. A. Rowley,
Editor of ‹Times Herald.›

Lorca, lŏr'kä, Spain, city, in the province of Murcia; on the Sangonera River; about 20 miles north of Aguilas, the Mediterranean port. It is an ancient city, established before the Moors came to Spain, as is evidenced by the older houses; but the main part of the city now existing is of Moorish construction. It has considerable manufacturing interests, and in the vicinity are valuable mines of silver, sulphur, and lead. The farms in the surrounding country have to be irrigated in the dry seasons, and for the storage of water of the Sangonera a dam, 800 feet long and 160 feet high, was built near the city. In 1802 the dam burst, and the valley was flooded. Many lives and much property were lost. Lorca was the scene of many battles between the Christians and the Moors. Pop. 70,127.

Lord (Anglo-Saxon «hlâford,» for «hlâfweard,» bread-keeper), English title of honor or dignity, used in different senses. In feudal times the lord was the grantor or proprietor of the land, who retained the ultimate property in it, the use only being granted to the tenant. Between the superior lord, or lord paramount, and the actual tenant, stands the lord of the manor or mesne lord. Lord is also a mere title of dignity, attached to certain official stations, which are sometimes hereditary, but sometimes only official or personal, as lord advocate, or lord mayor, a title applied to the chief magistrates of London, York, and Dublin. See also LORD CHAMBERLAIN and LORD LIEUTENANT. In its most definite sense in English it is equivalent to peer, but does not express any special rank or degree of nobility. The five orders of nobility constitute the «lords temporal,» in contradistinction to the prelates of the church, or «lords spiritual,» that is, such archbishops and bishops as are members of the legislature and sit in the House of Lords. The title is also applied, but only by courtesy, to the sons of dukes and marquises, and to the eldest sons of earls.

Lord, Chester Sanders, American journalist: b. Romulus, N. Y., 18 March 1850. He studied at Hamilton College, but was not graduated. He was for a time associate editor of the *Oswego* (N. Y.) *Advertiser*, and in 1872 became one of the staff of the New York *Sun*, of which he is managing editor. He was elected a regent of the University of the State of New York in 1897.

Lord, Edwin Chesley Estes, American geologist and chemist: b. Brooklyn, N. Y., 7 May 1868. He was educated in Brunswick and Heidelberg, Germany, and was assistant professor of mineralogy and petrography in Harvard from 1888 to 1901. In November 1901 he was appointed assistant in petrography and chemistry in the United States Department of Agriculture. He has published ‹Dissertation on Basalts of the Fichtelgebirge, Bavaria› (Heidelberg), and numerous papers in the bulletins of the U. S. Geological Survey and the U. S. Department of Agriculture, and in periodicals.

Lord, Eleanor Louisa, American educator: b. Salem, Mass., 27 July 1866. She studied in Smith College and in Bryn Mawr College, in America, and in Newnham College, Cambridge, England; and was fellow in history in Bryn Mawr, 1889–95. She taught in the Malden, Mass., High School, 1887–9; in Smith College, 1890–4; and in the Woman's College, Baltimore, after 1897. She has published ‹Industrial Experiments in the British Colonies of North America› (1898).

Lord, James Brown, American architect: b. New York 26 April 1859; d. there 1 June 1902. He was graduated from Princeton in 1879 and after studying architecture practised his profession in his native city, where he designed the Appellate Court in Madison Square, the first of the Carnegie branch libraries, and 16 of the other 65. He was chosen as architect of the Memorial Building erected by the class of 1879 of Princeton.

Lord, John, American historian and lecturer: b. Portsmouth, N. H., 10 Sept. 1812; d. Stamford, Conn., 15 Dec. 1894. He was graduated from Dartmouth in 1833; studied theology for a time at Andover Theological Seminary, and though not ordained to the ministry occupied Congregational pulpits in New Marlboro and Stockbridge, Mass. After 1840 he devoted himself to literary work, and lecturing. In 1843–6 he was in England, giving lectures on the Middle Ages, and on his return to the United States continued to lecture for many years in the principal towns and cities, giving over 6,000 lectures in all. From 1866–76 he was lecturer on history at Dartmouth College. His lectures were published under the title ‹Beacon Lights of History› (1883): he also wrote: ‹Modern History for Schools› (1850); ‹The Old Roman World› (1867); and ‹Ancient States and Empires› (1869).

Lord, John King, American educator: b. Cincinnati, O., 21 Oct. 1848. He was graduated at Dartmouth College in 1868. In 1869 he was made a tutor in Latin in Dartmouth; professor of Latin and rhetoric, 1872–80; professor of oratory and belles lettres, 1880–2; associate professor, 1882–92, and after 1892 professor of the Latin language and literature. He has edited many Latin text books and Chase's ‹History of Dartmouth College› (1891), is the author of an ‹Atlas of the Geography and History of the Ancient World› (1902), and has translated Hertzburg's ‹Geschichte der Römer im Alterthum› (1902).

Lord, Nathaniel Wright, American chemist and mineralogist: b. Cincinnati, O., 26 Dec. 1854. He was graduated at the Columbia School of Mines in 1876. Since 1883 he has been chemist for the Ohio Geological Survey and the Ohio State Department of Agriculture, and since 1888 professor of metallurgy and mineralogy in Ohio State University. He is the author of ‹Notes on Metallurgical Analysis,› and of numerous papers on scientific subjects.

Lord, William Frewen, English historical writer: b. Brighton, Sussex, 23 Feb 1861. He was educated at Trinity College, Cambridge, was attached to the Bombay civil service 1881-9, and was lecturer on and professor of modern history at the Durham College of Science, Newcastle-on-Tyne, 1899–1904. He has published: ‹The Lost Possessions of England› (1895); ‹Lost Empires of the Modern World›; ‹Life of Sir Thomas Maitland› (1897); ‹Development of Political Parties under Queen Anne› (1900); ‹England and France in the Mediterranean› (1901); ‹Counts of St. Paul› (1904).

Lord, William Paine, American soldier and diplomatist: b. Dover, Del., 1838; d. 17 Feb. 1911. He was graduated at Fairfield College, N. Y., in 1860, and at the Albany Law School 1911. He was graduated at Fairfield College, of Delaware cavalry, and as judge-advocate on the staff of General Lew Wallace. After the war he was given a lieutenancy in the regular army, and served at Forts Alcatraz and Steilacoom and in Alaska, resigning in 1868. He then settled in Salem, Ore., and took up the practice of law, was a State senator in 1878, and for 14 years sat on the Supreme bench of the State. He became governor of Oregon in 1895, and at the expiration of his term in 1899 was appointed U. S. minister to Argentina.

Lord Chamberlain, an officer in England who has control of the establishment attached to the chapels royal; of officers and servants attached to the royal chambers, except of those of the bedchamber; and over the medical men of the household. He appoints royal tradesmen, directs all great royal ceremonies, receives all applications to attend levées and drawing-rooms, superintends the royal wardrobe and the jewel house at the Tower, and licenses theatres and plays, his power extending to the cities of London and Westminster, and certain other parts of the metropolis, as well as to those places within which the sovereign may reside occasionally.

Lord Howe Islands, a group of small islands in the Pacific Ocean; nearly 500 miles east of Australia. They are of volcanic origin; and are nearly 3,000 feet above the sea. The group was discovered in 1788 by Lieutenant Ball, but was not colonized until 1840, when New South Wales was given charge of the government. In the surrounding waters there is an abundance of fish. The flora is beautiful and varied, banyan trees are conspicuous.

Lord Lieutenant, a British official of high rank, representing the sovereign, as: (1) The Viceroy, or Lord-lieutenant of Ireland, who is a member of the ministry, and retires from office on the resignation of the Cabinet. His power is quasi-regal; thus he can confer knighthood. In his government he is assisted by a privy council nominated by the sovereign. (2) The lord-lieutenant of a county, the principal official of a county, at whose nomination all deputy-lieutenants and justices of the peace are appointed, and first commissions in the yeomanry, militia, and volunteers are given.

Lord-Mayor's Day, the 9th of November, on which a great procession accompanying the newly elected Lord Mayor of London from Westminster to Guildhall takes place. The procession, formerly famous for its historical and allegorical devices, notably the huge wooden effigies called Gog and Magog, has now much dwindled.

Lord of the Isles, a title borne by chiefs who ruled the western islands of Scotland. They were descended from Somerled, the Lord of Argyll, on whom David I. conferred the islands of Arran and Bute after he had driven the Norwegians out. John, fourth and last Lord of the Isles, was deprived of his title and estates by the Parliament of May 1493. In 1540 the Lordship of the Isles was annexed to the Scottish crown, and from it the Prince of Wales derives one of his titles.

Lord Ormont and His Aminta, a novel, by George Meredith, published in 1894. In this tale the author's enigmatical laughter sounds louder than usual; possessing at the same time a quality which leaves the reader in doubt whether the mirth is at his expense or at the expense of the characters.

Lord's Day. See SABBATH.

Lords, House of. See PARLIAMENT.

Lord's Prayer, The, sometimes called «Our Father» or the «Pater Noster,» from the first two words in English or in Latin; and called the «Lord's Prayer» because taught by our Lord to his disciples. The prayer is given in the Bible, in Saint Matthew vi., and in Saint Luke xi. The prayer is given as a model, and in Matthew is introduced by the words: «After this manner therefore pray ye.» In Luke the introduction is: «When ye pray say,» and is followed by the words. There is a difference in the form as given in the two gospels mentioned. In Matthew the words are: «Our Father who art in heaven, hallowed be thy name; thy kingdom come; thy will be done as in heaven so upon earth. Give us to-day our daily bread; and forgive us our debts, as we also have forgiven our debtors; and lead us not into temptation; but deliver us from evil. Amen.» In Luke the words are: «Father, hallowed be thy name; thy kingdom come. Give us day by day our daily bread; and forgive us our sins; for we also forgive everyone indebted to us; and lead us not into temptation.»

The doxology, «For thine is the kingdom, and the power, and the glory for ever, Amen,» is not found in many of the best ancient authorities, and for that reason it is omitted in Tischendorf's eighth edition of the New Testament and in the Westcott and Hort Greek New Testament.

The prayer was introduced or taught in the «Sermon on the Mount,» and as given in Matthew, consists of nine parts — one salutation or invocation, seven petitions, and «Amen.» In the salutation there are three distinct points; first, the word «Father,» implying fatherhood, sonship, children of. Second, the word «Our,» which includes all mankind, a profession of brotherhood, a manifestation of charity in the most effective manner. Third, «Heaven,» where God is in His glory, for where His glory is revealed that is heaven. The seven petitions are usualy divided into three parts. The first three petitions refer to the honor of God; the last three to our own advantage; and the fourth petition has an element of both the first and the last groups. The first petition is, «Hallowed be thy name,» because by the name of a thing we express the object itself. «Hallowed be,» or as expressed by the Greek, «Sanctified be,» thy name among men — thy external glory throughout the whole world. The second petition is, «Thy kingdom come,»— internally and externally without any limitations. The third petition is, «Thy will be done as in heaven so upon earth,» which relates to free co-operation of our wills with the will of God; that obedience here will be as perfect as in heaven, that perfect peace may reign on earth. The fourth petition is, «Give us to-day our daily bread.» Various authorities differ as to the exact meaning of the word qualifying bread, some holding that it makes the word bread mean spiritual food alone, others, bodily food, necessary food for the body; others that it implies food for both soul and body. The fifth petition is, «And forgive us our debts (trespasses) as we also have forgiven our debtors (those who have trespassed against us). The petitions preceding related to something good to be obtained; the fifth petition relates to deliverance from evils. The word translated «debts» or «trespasses» is translated «sins» in the gospel of Luke. This petition asks that both the forgiveness and the perfection of the forgiveness on the part of God will correspond to our forgiveness of our enemies. The sixth petition is, «And lead us not into temptation.» The seventh petition is, «But deliver us from evil.» The word «but» in this place, confirms what has been said and forms the transition to what follows. Differences of opinion have existed as to the meaning of the word «evil,» some authorities regarding it as meaning the «evil one,» others as moral evil, anything that hinders spiritual progress. The fifth petition relates to freedom from sin, the sixth to deliverance from sin, the seventh to warding off all spiritual dangers. The «Amen» is a common ending to prayer, usually derived from the Hebrew verb meaning «to be firm,» or from a Hebrew noun meaning «truth,» and commonly rendered «so be it» or «may it be so.» In this place its signification is usually regarded as meaning a stronger confirmation of what has just been said. In places in the liturgy of the Roman Catholic, the Protestant Episcopal, and the Greek churches where the word «Amen» occurs, it is usually said by the server or clerk; but the «Amen» belonging to the «Lord's Prayer» is said by the celebrant of the mass.

Some of the early writers divided the petitions into six, thus joining the sixth and seventh. Many Protestant writers make this division, but Roman Catholic writers follow Saint Augustine, and divide the prayer into seven petitions. Lutheran writers generally follow this division, also the Protestant writers, Bleck, Hilgenfield, Keil, and Tholuck. The gradation of the petitions is remarkable: First, the honor and glory of God is sought; second, our own greatest good; third, the necessary means to attain eternal life; fourth, necessities for the present life; fifth, to be freed from the greatest evil; sixth, to be freed from the evil next to the greatest; seventh, to be freed from all evil. The fifth, sixth, and seventh petitions are directed against the respective impediments opposed to the good mentioned in the second, third, and fourth petitions.

The doxology is explained in various ways; as a liturgical addition, as an ancient continuation used by the priests and then the people. The «kingdom» in the doxology seems to refer to the first and second petitions; the «power» to the third petition; and the «glory» to the following petitions.

Directly following the «Lord's Prayer,» in the gospel of Saint Matthew vi. 14, there is an extension or explanation of the fifth petition, giving again the conditions of forgiveness; «For if ye forgive men their trespasses, your heavenly Father will also forgive you.»

Commentators differ as to the exact relation between the form of the «Lord's Prayer» in the gospel of Matthew and in Luke. It is held by many authorities that the prayer was taught on two different occasions, to different persons, except the apostles who were present on both occasions. Both forms were given as models, and both contain the essentials. The prayer occurs in all ancient liturgies except the so-called Clementine liturgy — given in the Apostolic Constitutions. In all the principal liturgies it occurs shortly before Communion.

Many polyglot collections of the prayer have been published from the 16th century downward, the most remarkable of which were those of John Chamberlayne in 150 languages (1715), of Conrad Gesner in 200 (1748), and that of Padre Hervaz in 307 (1787). There are expositions of the Lord's Prayer by Origen, Chrysostom, Gregory Nyssa, Cyprian, Luther, Leighton, and Tholuck.

Bibliography.— Maas, 'The Gospel According to Saint Matthew'; Kenrick, the gospels of Saints Matthew and Luke in 'The Four Gospels'; Saint Thomas Aquinas, 'The Lord's Prayer'; and the following authors in various writings, Bleck, Meyer, Kiel, Schanz, Spirago, Tholuck, W. Grimm, Hilgenfield, Peischel, Saint Augustine, and Saint Alphonsus.

Lords Spiritual, in Great Britain, archbishops and bishops of the Anglican Church, who are given seats in the House of Lords. The present primate of all England, who is the 95th Archbishop of Canterbury, was nominated by King Edward soon after the death of Queen Victoria, and stands at the head of the Lords Spiritual. Among the most important and least known of the prerogatives of the Archbishop of Canterbury, is that of heading the commission of great dignitaries of the realm who form a species of council of regency in the event of any time intervening between the demise of a sovereign and the assumption of the reins of government by his successor. The Archbishop of Canterbury, in addition to an official residence within the cathedral precincts at Canterbury, and a stately palace in London, possesses a stipend of $75,000 a year. But few are aware of the sources from which this money is derived. It does not form part and parcel of the supplies voted every year by Parliament for the administration of the government. Nor is it derived from the revenues of the state, that is to say, from the pockets of the taxpayers. The Church of England is enormously rich. Not all ecclesiastical property was diverted from religious uses at the time of the Reformation. Much of it was left to endow the Church of England, and to-day the annual income of the latter is estimated at near $40,000,000, the administration of which is vested in the hands of a body known as the Ecclesiastical Commissioners, who pay to the archbishops and bishops their stipends, provide salaries for the minor dignitaries of the Church, and spend the remainder in improving the parochial endowments and buildings, and in providing funds for additional clergy. The Ecclesiastical Commission consists of the two archbishops, namely, of Canterbury and of York, of all the bishops of English and Welsh dioceses, of the deans of Canterbury, St. Paul, and Westminster; of five cabinet ministers, three judges of the High Court of Judicature, and twelve laymen, all of them churchmen of the Church of England, two being appointed by the Archbishop of Canterbury and the remainder by the crown.

The Commissioners have the power of creating new bishoprics, deaneries, and archdeaconries, of creating new parishes, of uniting existing ones, etc. But any of the more important steps which they take have to be ratified by the king and council, that is to say, by the sovereign sitting with a quorum of his Privy Council, and when thus ratified the acts of the Ecclesiastical Commissioners have the power of an act of Parliament.

The Archbishop of Canterbury, like the Archbishop of York and the 24 bishops who represent the Established Church in the House of Lords, is not a peer of the realm, but only a Lord Spiritual of Parliament. The Lords Spiritual have no right to demand trial by the House of Lords as peers, but are amenable to the jurisdiction of the ordinary courts of law. . Although the Lords Spiritual of the upper house are distinct from the Lords Temporal, they do not vote separately, but jointly, forming for purposes of legislation one estate. The prelates vote on every subject brought before the Lords, except in trials for high treason and other cases of a criminal nature. On such occasions they never attend or vote; this, however, being in deference to those canon laws which forbid them from participating in matters of blood, and not owing to any parliamentary requirement. There can be no quorum of the House of Lords without the presence of an archbishop or bishop, two peers and a prelate being needed to constitute a House of Lords for the transaction of business, and the Spiritual Lords cannot vote or even take their seats in the House unless robed in their ecclesiastical vestments, with rochet, lawn sleeves and mortarboard cap complete. The discrimination between the peers of the realm and the Lords Spiritual of Parliament also extends to the families of the latter.

Lord's Supper (Lat. *Cœna Domini*, Fr. *La Sainte Cène*, Ger. *Abendmahl*), one of the sacraments of the Christian religion, in the observance of which Christians commemorate the death of the Founder of their religion. It is so called because the Lord Jesus Christ instituted the rite when he took his last meal with his disciples. It has also the names of *eucharist* and *communion*, and is celebrated by all Christian bodies however much their views may differ as to its nature and virtue, except the Quakers. It was instituted at the time of the Jewish passover, as we read in the gospels of Matthew, Mark, and Luke, the two former agreeing very closely in their accounts, while that of Luke has features of its own. A brief statement to the same effect is in 1 Cor. xi. There is no corresponding section in the fourth gospel, though in John vi., Christ speaks of the eating of his flesh and the drinking of his blood. In all the churches founded by the apostles the Lord's Supper was introduced. In the 1st and 2d centuries this rite was celebrated in connection with the *agapæ* or *love-feast*. After the third century when the congregations became more numerous, the *agapæ* ceased, and the Lord's Supper was from thence celebrated separately in the churches, in such a way that all present could partake, with the exception of catechumens (that is, Christians not yet baptized) and unbelievers. These were obliged to withdraw when the celebration of the Lord's Supper commenced, because communion was considered as a mysterious act, which was to be withheld from profane eyes. The deacons carried the bread of life to those whom sickness or imprisonment had prevented from being present at the meeting of the congregation. It was always believed to possess a peculiar efficacy, and ideas of the awful and mystical were associated with it. From the first, Christians ascribed supernatural power to the rite, and the consecrated bread and wine were regarded as more than mere bread and wine, and as having become, in some mysterious way, the body and blood of our Saviour. In the early Church we find no scientific formulation of the change undergone by the sacred elements, but in the 9th century, in consequence of the attacks of Berengarius (q.v.) on the doctrine of the Real Presence, the term, transubstantiation, commonly ascribed to Paschasius Radbertus first, came into use to describe metaphysically the real and objective change of the elements of bread and wine into the body and blood of Christ. This term was adopted by the Council of Rome in 1079, and confirmed in 1215, in the Fourth Lateran Council, by Innocent III., and has ever since been employed by the Roman Catholic Church as the proper expression of her faith in the Eucharist. The Council of Trent in the 16th century laid it down as of faith to confess the "change" of the whole substance of the bread into the body, of the whole substance (*substantiæ*) of the wine into the blood [of Christ], only the appearances (*species*) of bread and wine remaining; which change the Catholic Church most fitly calls Transubstantiation." The Roman Catholic Church holds that the Eucharist has been both a sacrament and a sacrifice from the beginning. This, she declares, is evident from Christ's words of institution, as narrated in the synoptic gospels and from St. Paul's words in his first Epistle to the Corinthians. And unbroken testimony from the Apostles through the Fathers of the Church, she further avers, bears ample evidence to her claim; besides this, she claims that her own witness as the duly divinely appointed guardian of the deposit of revelation and its infallible interpreter commissioned to teach all nations, is sufficient seal to the truth of the doctrine. As a sacrament it is the true body and blood of Christ under the appearance of bread and wine to be partaken by the faithful as a means of grace and union with Christ; as a sacrifice it is the unbloody oblation of the body and blood of Christ by a duly appointed minister, that is, priest, by whom alone the elements can be consecrated. Such she declares has been the Christian teaching and practice from the beginning. The reception of the sacrament under both kinds, that is, under the forms of both bread and wine, was general until the Middle Ages, when communion under one kind, bread alone, began to be adopted, partly to avoid the danger of spilling the consecrated wine and partly to counteract a growing heresy that Christ was not received whole and entire under either kind alone. The Council of Constance, in the 15th century, made it universally obligatory to communicate under one kind to meet the heresy of Huss and Jerome of Prague. The Protestant reformers in the 16th century averred that the Church had deviated in the celebration of the Lord's Supper from the purpose of Christ and the example of the apostolic age, and both the German and Swiss reformers agreed in rejecting the doctrine of Transubstantiation and the mass, and maintaining that the Lord's Supper ought always to be celebrated before the whole congregation, and with the administration of both bread and wine. In explaining the words by which the supper was instituted, Luther and Zwinglius differed, and their different opinions on this subject formed the principal subject of the dissension between the Lutheran and Calvinistic churches. Luther took the words, "This is my body," etc., in their literal sense, and thought that the body and blood of Jesus Christ were united, in a mysterious way, with the bread and wine, which, however, remain unchanged, so that the communicant receives, in, with, and under the bread and wine, the real body and blood of the Redeemer. Zwinglius, on the other hand, understood the words in a figurative sense, and supposed that Jesus Christ meant to say, "The bread and the wine represent my body and my blood," and maintained, therefore, that the bread and wine were mere signs of the body and the blood of Christ, and that the Lord's Supper was a mere commemoration of the death of Christ, and a profession of belonging to his church, and this view was in substance adopted by the Socinians and Arminians. From this difference of opinion arose a violent dispute between Luther and Zwinglius, which in later times has been continued between the Lutheran and Calvinistic divines. The opinion advanced by Calvin, by which a spiritual presence of the body and blood of Christ is supposed in the communion, by partaking of which the faithful receiver is brought into union with Christ, through the medium of the Holy Ghost, though it came nearer to the Lutheran doctrine than that of Zwinglius did, yet was essentially different, and therefore also met with a strong opposition from the strict adherents of Luther. Melanchthon inclined to the Calvinistic notion, and so did many other Lutheran divines, who were called by the opposite party Philippists and Crypto-Calvinists. The *formula concordiæ*, or articles of religious peace, suppressed the Crypto-Calvinists in the greatest part of the Lutheran Church, and established the idea of Luther, consequently there was a final separation of the Lutheran and Reformed or Calvinistic churches, but in recent times many Lutheran divines have inclined to the Calvinistic doctrine. The Greek Church has substantially held the doctrine of Transubstantiation in its whole extent. The Oriental Christians differ from the Western, in using leavened bread in the Lord's Supper, and in administering it to children. (See Greek Church.) It thus appears that the differences between the contending churches hinge on the *mode* in which the body and blood of Christ are present in the elements of bread and wine, for that they are in some way present is admitted by them all. The Protestant churches hold that *presence* means presence in efficacy, and will admit that it is «real» in the sense of being efficacious, though not in the sense of being corporeal. However, when they are called on to define efficacy they differ in this, that some mean by it a sacrificial, and others a mysterious supernatural efficacy, emanating from Christ's glorified body. The confessions of the Protestant churches were framed expressly to conciliate the Lutherans, and contain, in consequence, more of the mystical element than is consistent with the sentiments of the framers, as expressed in their writings. The 28th article of the Church of England, while repudiating Transubstantiation as «repugnant to the plain words of Scripture,» declares «that to such as rightly, worthily, and with faith receive the same, the bread which we break is a partaking of the body of Christ, and likewise the cup of blessing is a partaking of the blood of Christ.» It further declares that «the body of Christ is given, taken, and eaten in the supper only after a heavenly and spiritual manner. And the mean whereby the body of Christ is received and eaten in the supper is faith.» The Westminster Confession, chap. xxix., s. 6 and 7, thus formulates the doctrine adopted by the Presbyterian Church of Scotland, which in the main agrees with that propounded by Calvin: «That doctrine which maintains a change of the substance of bread and wine into the substance of Christ's body and blood (commonly called Transubstantiation) by consecration of a priest, or by any other way, is repugnant not to Scripture alone, but even to common sense and reason, overthroweth the nature of the sacrament, and hath been and is the cause of manifold superstitions, yea, of gross idolatries. Worthy receivers, outwardly partaking of the visible elements in this sacrament, do then also inwardly by faith, really and indeed, yet not carnally and corporally, but spiritually, receive and feed upon Christ crucified, and all benefits of his death: the body and blood of Christ being then not corporally or carnally in, with, or under the bread and wine; yet as really, but spiritually, present to the faith of believers in that ordinance, as the elements themselves are to their outward senses.» The elevation, adoration, and carrying about of the host, practised in the Greek and Roman Catholic churches is thus spoken of in the 28th article of the Anglican Church: «The sacrament of the Lord's Supper was not by Christ's ordinance reserved, carried about, lifted up, or worshipped.» While the Roman Catholic Church makes its communicants receive the consecrated wafer with the mouth from the hands of the priest, the Protestant churches put the bread and the chalice into the hand of the communicant.

Lordwood. See Liquidambar.

Lorelei, lō'rĕ-lī, or **Lurlei**, loor'lī, a rock in the Rhine, near St. Goar, about 425 feet above the river. Once a serious menace to passengers on the river and always famed for its echo, the rock has been personified by German poets, notably Heine, as a siren, luring sailors to destruction by the music of her voice, an evident idealization of the danger of the rock and of its echo.

Lorente, Sebastian, sä-bäs-tĭ-än lō-rĕn'tĕ, Peruvian historian: b. about 1820; d. Lima November 1884. He was a professor of history at the University of San Marcos from 1845 and made valuable contributions to the historical literature of his country in his ‘History of Peru’ (5 vols., 1860); ‘History of the Conquest of Peru’ (1861); and articles in the ‘Peruvian Review.’

Lorenz, lō'rĕnts, **Adolf**, Austrian orthopædic surgeon: b. 1854. He was graduated from the University of Vienna in 1880, and worked as an assistant under Theodor Billroth in Vienna. On the advice of the latter he began specialization in orthopædic surgery, and after years of study developed his so-called «bloodless» method of reducing congenital dislocation of the hip joint. Before he developed his own method of operation he was one of the chief exponents of Hoffa's cutting method, which, however, he modified largely. His operation consists of the forcible stretching of all the soft parts about the hip until the head of the bone can be brought to the place where the socket should be (the acetabulum), and then holding it in that position and rotating the joint to secure it in the depression of the acetabulum. A plaster of paris cast is worn by the patient from six to nine months after the operation. Dr. Lorenz has performed this operation successfully in a large percentage of his cases; he demonstrated his method before the Medical Congress at Berlin in 1895; and has also given demonstrations in England and the United States. His visit to the United States (1902) aroused widespread interest and enthusiasm. He is now (1904) professor of orthopædic surgery at the University of Vienna and a government councillor. His publications include: 'Orthopädie der Hüftgelenks-Kontrakturen und Ankylosen' (1889); 'Das instrumentelle kombinierte Redressement der Hüftgelenks-Kontrakturen' (1898); and 'Ueber die Heilung der angeborenen Hüftgelenks-Verrenkung durch unblutige Einrenkung und functionelle Belastung' (1900).

Lorenz, lō'rentz, **Ottokar,** German historian: b. Iglau 7 March 1832. His first work was 'The Consular Tribunal' (1855). He was appointed professor of history in the University of Vienna, 1862, and in 1885 accepted a call to the University of Jena. Among his writings are: 'German History in the 13th and 14th Centuries' (1863); 'Sources of Mediæval German History' (1870); 'History of Alsace,' with Scherer (1871); 'History and Politics' (1876); 'Genealogical Manual of the History of European States' (1895).

Lorenzo, lō-rĕn'so, or **Lourenço Marques,** lō-răṅ'sō mär'kĕs, East Africa, a Portuguese province and port, the latter on Delagoa Bay, and the seacoast terminus of the railway to Pretoria in the Transvaal Colony, completed in 1895. A considerable import and export trade is carried on. Pop. about 7,000, of whom 5,130 are Europeans. See Delagoa Bay.

Loreto, lō-rā'tō, Italy, city in the province of Ancona; about five miles from the Adriatic Sea and 15 miles south of the city of Ancona. It is situated in a fertile agricultural region, remarkable for its beautiful scenery. The city is known for its possession of the Santa Casa, said to be the house in which Jesus, Mary, and Joseph lived while in Nazareth. The building is 31 feet in length and 13 feet in width. It is enclosed in a stately domed church, the work of Bramante, and stands under the dome. The original outer walls have been covered, but inside the coarse stonework of the original masonry is visible. The material is a dark reddish-colored stone, unlike the stone in the vicinity. The tradition is that after the power of the Christians was destroyed in Palestine, by the capture of Acre, in 1291, on 10 May 1291, angels moved this house from Nazareth to the hill of Tersatta, near Fiume. After a time, on 10 Dec. 1294, the house was again removed by angels to the opposite side of the Adriatic, near Recanati; and again, in 1295, it was removed to where it now stands. Consult: Caillu, 'Histoire, Critique et Relig. de N. D. de Lorette' (1843); Hutchinson, 'Loreto and Nazareth' (1863); Jerome Angelita, 'Historie della Translatione della Santa Causa'; Kenrick, 'The Holy House of Loreto'; Meyrick, article on Loreto in 'Christ, Remembrances'; Stanley, 'Sinai and Palestine'; Zucchi, 'Istoria di Loreto.'

Loreto, Peru, an interior department watered for thousands of miles by the Marañon and its tributaries; area, 288,456 square miles; pop., chiefly Indians, about 100,000. The quickest route from the coast to this province, which is only about 700 miles distant in a direct line, is round the northern coast of South America and up the Amazon, a journey of 6,500 miles. Loreto is separated from the coastal departments by the Andes, has a tropical climate, and is densely forested; the chief products are rubber and salt. The principal towns are Moyobamba (the capital, pop. 10,000), Taropoto, and Iquitos.

Lorette, Ancienne, ăn-sē-ĕn lō-rĕt, Quebec, Canada, a village seven miles southwest of Quebec city, with industries connected with the waterworks of Quebec. Pop. 1,600. Three miles to the north is Indian or Jeune Lorette, peopled by about 300 Christianized Indians, descended from the last of the Huron Indians who had found a refuge at Ancienne Lorette in 1650. The settlement was removed to Jeune Lorette in 1697. Jeune Lorette commands a fine view of Quebec for which it is visited, as also for the falls of Lorette, and for its ancient chapel and statue of the Virgin, a replica of those at Loreto, Italy.

Loria, lō'rē-ä, **Achille,** Italian economist: b. Mantua 1857. He studied law at Bologna, and proceeding successively to Rome, Berlin, and London, made a study of economical problems. In 1881 he was appointed professor of economics at Siena and 10 years later at Padua. He has approached the subject of wealth distribution and land-tenure in a hopeful spirit of optimism, and has published many works on the subject. Among his writings are: 'Studii sul Valore della Moneta' (1891); 'La Terra ed il Sistema sociale' (1892); 'La Costituzione economica odierna' (1889); and 'Il Capitalismo et la Scienza' (1901).

Lorica'ta. In zoology, (1) the group of pagolins (see Manis); (2) the group of *Crocodilia;* (3) a group of decapod *Crustacea,* which includes the spiny lobsters (*Palinurus,* etc.), and the bear-crabs (*Scyllarus, Ibacus,* etc.). These forms are large, with thick shells and without pinching claws. All are edible, the spiny lobster replacing the true lobster as an article of food in the warmer parts of the earth.

Lorient, lō-rē-ôṅ, or **L'Orient,** France, a fortified seaport town, in the department of Morbihan, at the mouth of the Scorff, on the Bay of Biscay; about 40 miles west of Vannes. It was founded in 1666 by the East Indies Company, and in 1690 it became a military fort. After the dissolution of the company, in 1782, the government bought the ship-building plant. The large harbor can accommodate with safety a great number of vessels. Lorient is a station of the French fleet, and has extensive docks and building yards for the construction and fitting out of war vessels. It has, also, large artillery barracks, an artillery park, and a marine arsenal. It has an observatory, schools of marine, artillery, and hydrography, and other educational institutions, and a large number of manufacturing establishments. About five miles south of Lorient is the fortified town of Port Louis.

Lorikeet', a small kind of lory (q.v.)

Lorimer, lôr'ĭ-mėr, **George Claude,** American Baptist clergyman: b. Edinburgh, Scotland, 1838; d. Aix-les Bains, France, 7 Sept. 1904. He came to the United States in 1856 and was educated at Georgetown College, Ky. In 1859 he was ordained to the Baptist ministry, and held pastorates at Harrodsburg, Paducah, and Louisville, Ky.; he was then at Albany for a short time, at the Shawmut Avenue Church and Tremont Temple in Boston in 1870–9; and in Chicago till 1891. In the latter year he returned to Boston to become pastor at Tremont Temple. In 1902 he went to New

York as pastor of the Madison Avenue Church. He was associate editor of the 'Watchman' and has written 'Isms Old and New' (1882); 'Under the Evergreens' (1872); 'The Great Conflict' (1876); 'Studies in Social Life' (1886); 'Christianity and the Social State'; 'Christianity in the Nineteenth Century'; 'Messages of To-day to the Men of To-morrow' (1897); and a 'Master of Millions' (1903), a story of modern life.

Lorimer, George Horace, American journalist: b. Louisville, Ky., 6 Oct. 1868. He is a son of G. C. Lorimer (q.v.), and was educated at Colby College, and at Yale. Entering the field of journalism, he advanced steadily in his profession, and since 1899 has been editor-in-chief of the 'Saturday Evening Post,' Philadelphia. He has written 'Letters from a Self-made Merchant to his Son' (1902).

Lorimer, John Henry, English painter: b. Edinburgh 1856. He was educated at the Edinburgh Academy and University, and began his art studies at the Royal Scottish Academy. One of his pictures was admitted to the annual exhibition of that institution when he was but 19. His most important exhibited pictures are 'The Ordination of Elders'; 'Pot Pourri'; 'The Eleventh Hour' (1896), which received a second class medal at the Salon, and in 1890 was awarded a gold medal at the Paris Exposition. In 1894 the French government bought his 'Benedicite,' which is now in the Luxembourg, where his portrait of Colonel Anstruther Thompson has also been deposited.

Lorimer, Norma Octavia, Scottish novelist: b. Auchterarder, Perthshire, 1864. She has been an extensive traveler, having spent three years in the United States, and has written 'Josiah's Wife'; 'By the Waters of Sicily' (1901); 'Catherine Sterling' (1902); etc.

Loring, lōr'ĭng, **Charles Greeley**, American lawyer and orator: b. Beverly, Mass., 1794; d. 1868. He was graduated from Harvard in 1812 and practised his profession in his native city, becoming in 1857 actuary of the Massachusetts Hospital Life Insurance Co. In 1862 he entered the State senate. He was of much prominence as an orator and was the author of 'Neutral Relations between the United States and England' (1863); 'Life of William Sturgis' (1864).

Loring, Charles Greeley, son of the preceding: b. Boston 1828; d. Pride's Crossing, Beverly, Mass., 20 Aug. 1902. He was graduated from Harvard in 1848 and served in the Union army during the Civil War, being brevetted major-general of volunteers at its close. He became a trustee of the American Museum of Fine Arts in 1873 and was the executive officer of the institution from 1876 until his death.

Loring, Edward Greeley, American jurist: b. Massachusetts 1802; d. 1890. He was graduated from Harvard, and for many years was probate judge and United States Commissioner in Boston. While holding this post he sent back into slavery the negro Anthony Burns, and for this act was removed from the bench. In after years he was appointed by President Lincoln judge of the Court of Claims, which post he resigned in 1877.

Loring, Ellis Gray, American lawyer: b. Boston 1803; d. 1858. He was educated at the Boston Latin School, entered Harvard in 1819, but without graduating left college and studied law. In 1827 he was admitted to the bar, where he soon won high distinction. He was one of the first pleaders for the abolition of slavery, and one of the founders of the first anti-slavery society, in Boston, 1832, whose constitution he wrote. As a defender of fugitive slaves he gave freely of his time and talents, and shared the odium visited upon all the early abolitionists. Before the Supreme Court of Massachusetts he made a memorable defense of a slave-child called Med, by which, against so formidable an opponent as B. R. Curtis (q.v.), he secured a decision declaring that every slave brought into that State thereby became legally free. The effect of his convincing argument was both instantaneous and lasting, and his triumph was a substantial service to the anti-slavery cause. He published numerous addresses on the slavery question.

Loring, George Bailey, American agriculturalist: b. North Andover, Mass., 8 Nov. 1817; d. Salem, Mass., 14 Sept. 1891. He was graduated from Harvard in 1838 and from the Harvard Medical School in 1842, and after several years of medical work at the Chelsea Marine Hospital devoted himself from 1850 onward to scientific agriculture, writing many essays and papers on farming and allied topics. He became famous as an orator, served several terms in the Massachusetts legislature, was member of Congress 1876–81, United States commissioner of agriculture 1881–5, and minister to Portugal 1889–90. He was president of the Massachusetts State Agricultural Society for many years.

Loring, William Wing, American general: b. Wilmington, N. C., 4 Dec. 1818; d. 30 Dec. 1886. He entered the United States army as a private in a troop of volunteer cavalry, and was active in the Florida war in 1835–42. During the war with Mexico he was distinguished for bravery at Contreras, Churubusco, and Chapultepec, and was brevetted lieutenant-colonel and colonel. Although opposed to secession he held States Right views and in May 1861 resigned his commission and became a brigadier-general in the Confederate army and later major-general. For a few years after the close of the war he was a banker in New York, then went to Egypt in 1869 and was made a pasha and chief of staff in the army of the Khedive. In 1879 he returned to the United States and published a description of his Oriental experiences in 'A Confederate Soldier in Egypt' (1883).

Loris. See LEMUR.

Loris-Melikoff, lō'rĭs-mĕl'ĭ-kŏf, **Mikhail Tarielovitch Tainoff**, COUNT, Russian soldier and statesman: b. Tiflis, Russia, 1 Jan. 1826; d. Nice, France, 22 Dec. 1888. He was of Armenian descent, entered the army in 1843, and distinguished himself at the siege of Kars in 1854. He served in the Crimean war and was made lieutenant-general in 1863. In the Turco-Russian war of 1877 he took Kars in November and for his services in the campaign was made a count in 1878. In 1880 he was appointed minister of the interior, in which post he showed a tendency toward liberal measures, but on the accession of Alexander III. his position became untenable, and he resigned.

Lorna Doone, lôr'na doon, a romance of Exmoor, a famous novel by R. D. Blackmore, published in 1869. It is its author's best-known work, and its popularity has been equally great on both sides of the Atlantic. Much as Hardy acquaints us with Wessex, Blackmore impresses Exmoor upon us. It is out-of-door England, with swift streams, treacherous bogs, dangerous cliffs, and free winds across the moors.

Lorne, lôrn, MARQUIS OF (JOHN GEORGE DOUGLAS SUTHERLAND CAMPBELL). See ARGYLE, CAMPBELLS OF.

Lorraine, lō-rān', or **Lotharingia,** was a province of France, situated on its Northeastern frontier, and included such important towns as Metz, and Thionville. It was included in Charles the Great's empire, and on the dissolution of that empire passed through a series of vicissitudes, being subsequently created into a German duchy. In 1871 at the close of the Franco-German War, the greater part of Lorraine, including Metz and Thionville, was annexed to Germany. (See ALSACE-LORRAINE.) See also Hassal's 'Periods of European History' (1901) and Lavisse et Rambaud's Histoire Generale (1892).

Lorraine, Claude. See CLAUDE LORRAINE.

Lo'ry, any of several East Indian parrots, but more especially one of the brush-tongued family *Trichoglossidæ,* the smaller examples of which go by the name of lorikeets. Both the lories and the lorikeets are remarkable for their extensible tongue, furnished with a pencil at its extremity, by which they are enabled to lick up the nectar of flowers. The lorikeets are smaller than the lories, and have long tapering tail-feathers. Swainson's lorikeet (*T. novæ-hollandiæ*) is the best known species. It is found in eastern Australia and Tasmania, and is popularly known as the blue mountain lory or the blue mountaineer.

The name lory is also given to the large brilliantly colored parrots of the psittacine genus *Eclectus.* Consult Newton, 'Dictionary of Birds' (1896) and see PARROTS.

Los Andes, or **Santa Rose De Los Andes,** State of Venezuela, on the northern flank of the cordillera of Merida. The valleys are fertile, and produce cocoa, coffee, sugar, and, on the higher slopes, wheat and other cereals. Forests extend up to 10,000 ft., above which are the bleak paramos, where only grasses grow. Hot springs are numerous. Area, 14,719 sq.m. Pop. 336,200.

Los Angeles, Cal., city, county-seat of Los Angeles County. The pious Spanish pioneers who first introduced civilization in Alta California were in the habit of giving names to places in accordance with the church calendar. Consequently, when mass was first celebrated on the present site of the city, in 1781, it was named Nuestra Senora Reina de Los Angeles, which the practical Yankees upon their arrival, at once proceeded to shorten. Los Angeles is about 15 miles in an air line from the Pacific Ocean, in the valley of the Los Angeles River, a dry river bed in summer, but in winter sometimes a lively stream for a short time after a heavy winter rainfall.

The Sierra Madre range of mountains is about 10 miles north of Los Angeles. These mountains may be seen from most any part of the city. There is also a lower range of mountains extending from the city to the ocean. Originally Los Angeles covered an area of 36 square miles, extending three miles in each direction from the old Plaza. Within the past few years numerous additions have been made, including a "shoe string strip" extending from the city to the ocean, and taking in the ports of Wilmington and San Pedro. The average altitude is 300 feet above sea level. The northern part of the city is hilly.

The city has railroad competition, in the shape of four trans-continental lines, two Southern Pacific systems, by way of Ogden and El Paso, the Sante Fe, by way of Albuquerque, and the San Pedro, Los Angeles & Salt Lake railroad, from Salt Lake. Altogether there are a dozen lines of railroad leading to Los Angeles, including a most complete and elaborate suburban electric railroad system, aggregating nearly 400 miles of double track, some of the lines having four tracks. The electric street railway system is also most complete, the total mileage of single track being over 350 miles. Half a dozen lines run large and commodious steamships to San Francisco, Portland, and Puget Sound on the north, and to San Diego on the south.

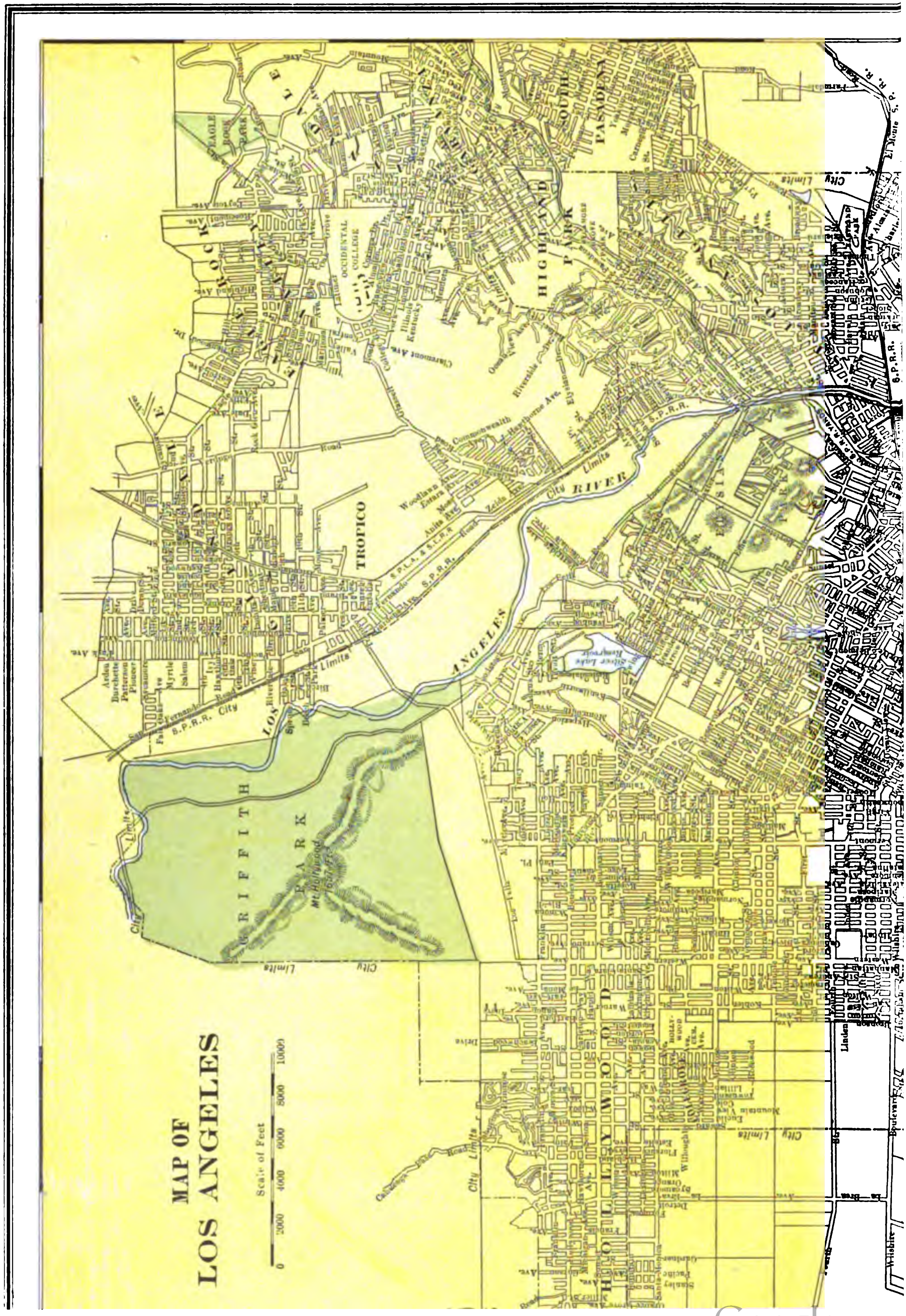
There are a dozen public parks within the city limits, aggregating nearly 4,000 acres, four of them having lakes of considerable size. Los Angeles is a city of homes; a large proportion of the people owning their own dwellings. The city is practically frostless, callas, heliotropes, and other delicate plants flourishing throughout the winter in the open air. The residence streets are generally aligned by evergreen shade trees. There are over 600 miles of improved streets, 100 miles being paved with asphaltum. A sewer system extends to the ocean.

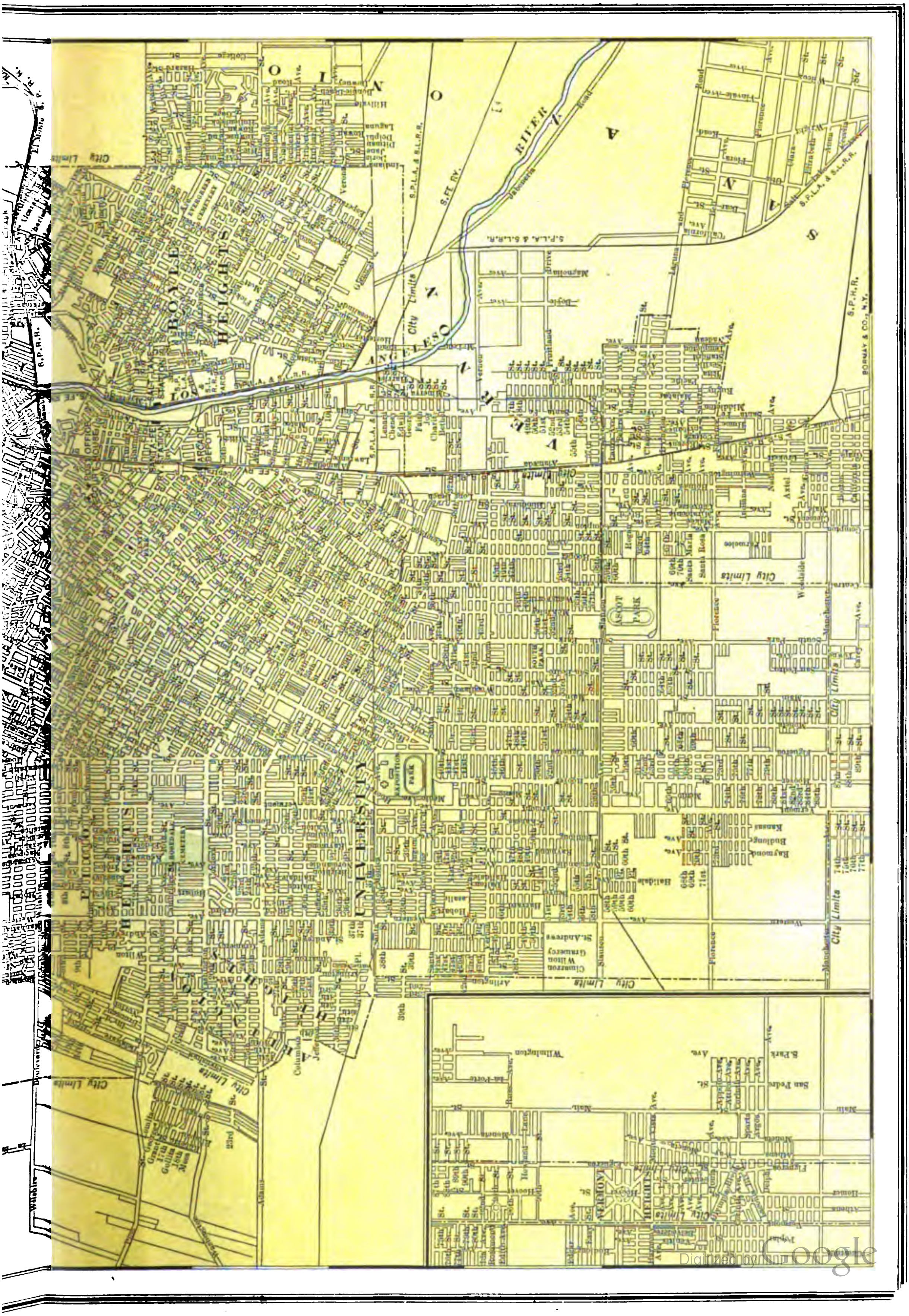
The bank clearings of Los Angeles for the year 1911 amounted to nearly a billion dollars —$943,963,357. The building permits in 1911 aggregated $23,004,185. The principal annual municipal expenditures are as follows: Schools, $124,241; police, $602,045; street cleaning, $156,699; fire department, $543,819; lighting, $257,552; parks, $256,531. The post-office business has increased within 10 years from $258,000 to $1,500,000.

The city is the site of the University of Southern California, a Methodist establishment. Occidental College is conducted by the Presbyterians. The Roman Catholics have a college and three academies. There is a State Normal school, a high school, a Polytechnic high school, a public library with nearly 200,000 volumes, and many handsome church buildings of all leading denominations. Los Angeles boasts of the finest Y. M. C. A. building in the world.

The mayor of Los Angeles holds office for two years. He appoints five trustees for the library, and is ex-officio a member and chairman of several committees. The City Council of nine members, chosen by election from the city at large, has four commissioners who have charge respectively of police, health, fire and park departments. The Board of Education consists of nine members chosen by election from the city at large.

Los Angeles has the advantage of being located on the shortest road by the lowest grades between the Atlantic and Pacific oceans. After the opening of the Panama


MAP OF LOS ANGELES


LOS ANGELES
BOYLE HEIGHTS
UNIVERSITY
HEIGHTS
VERMONT HEIGHTS
ASCOT PARK
EXPOSITION PARK
LOS ANGELES RIVER
City Limits
S.P.R.R.
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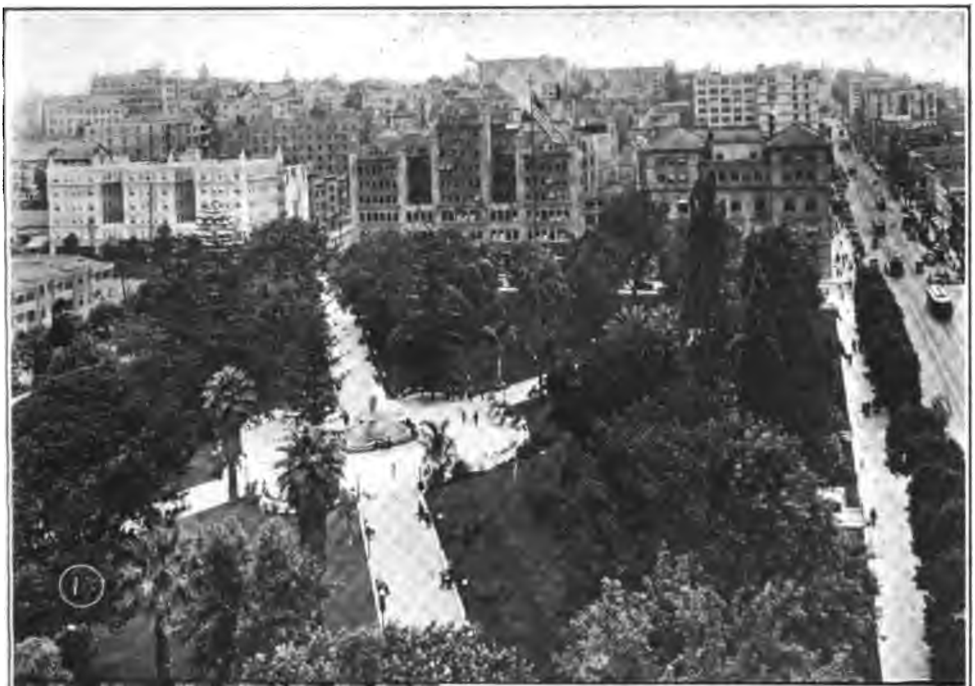
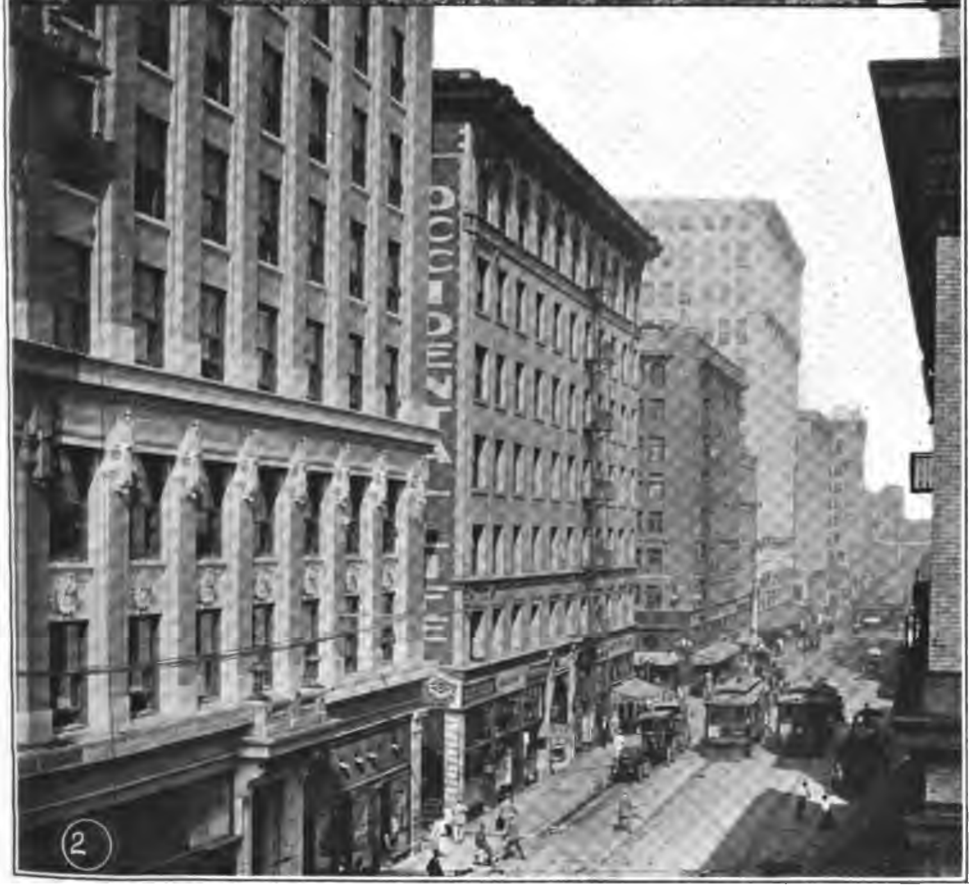
S.FE RY.
BORMAY & CO., N.Y.

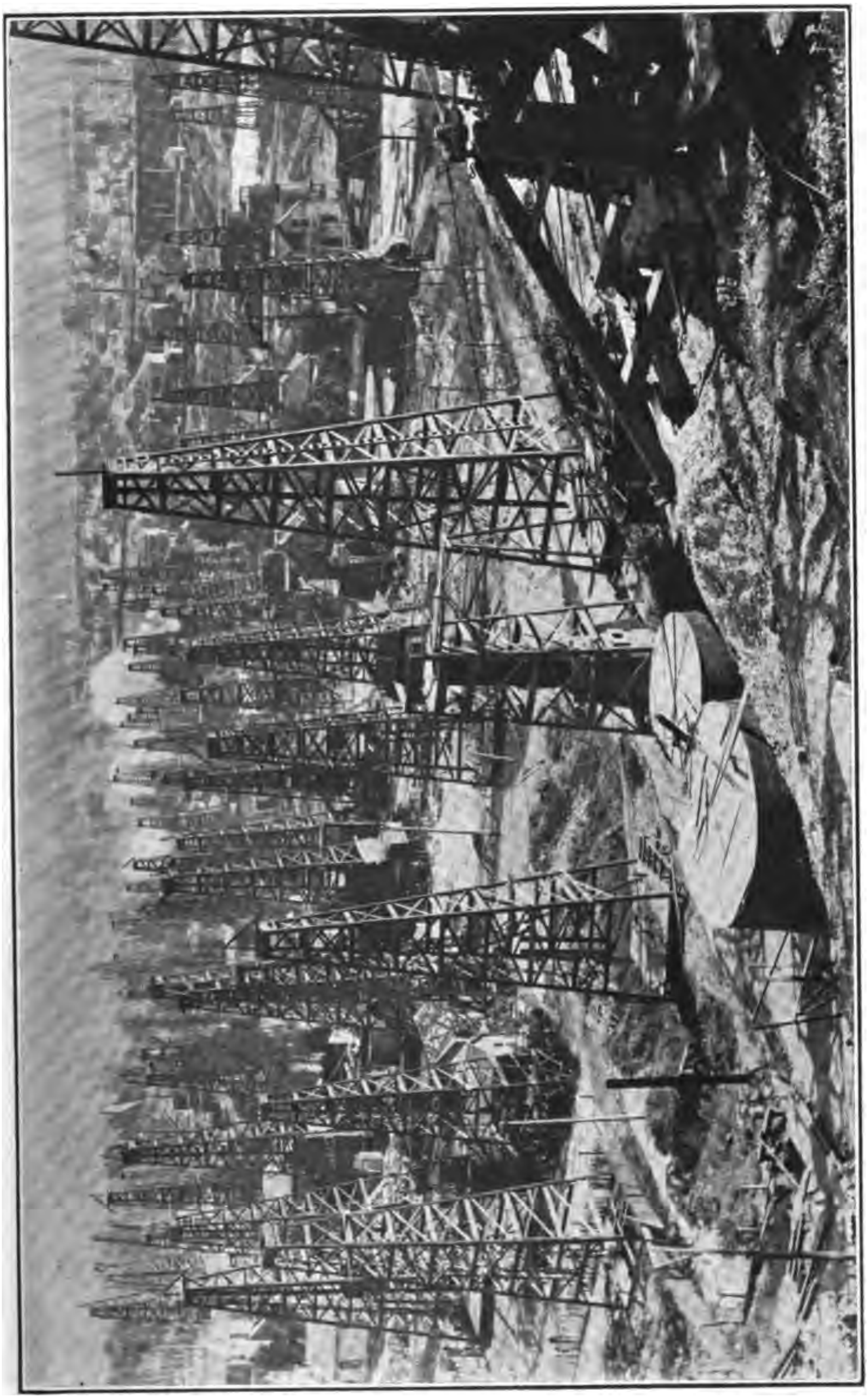
LOS ANGELES.





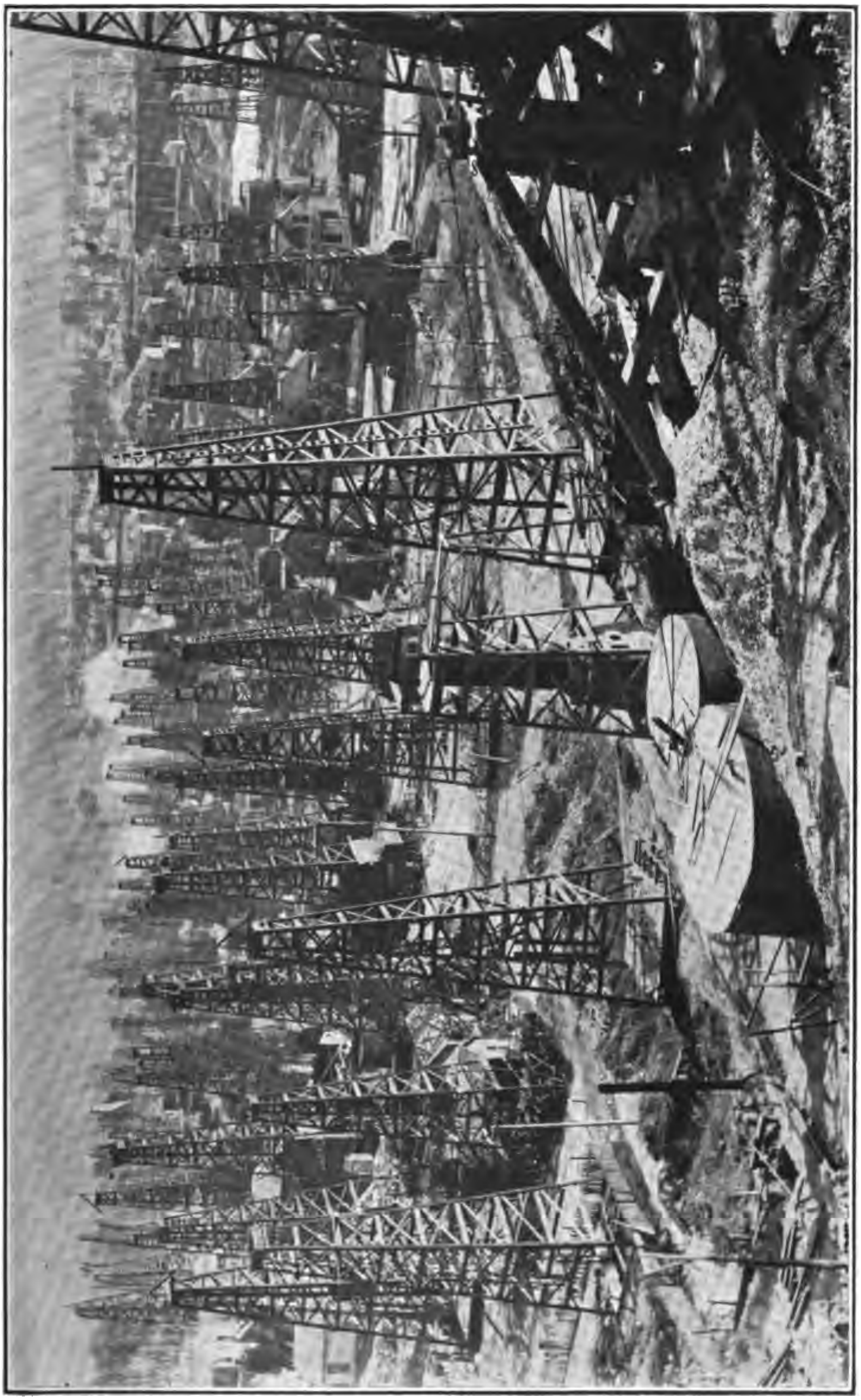
1. Central Park, looking north on Hill Street. Temple Auditorium in the background.
2. View of Sixth Street, looking west from Main Street.

LOS ANGELES.



Oil Wells Inside City Limits.

LOS ANGELES.



Oil Wells Inside City Limits.

Canal it will be close to the direct route of vessels sailing from the Atlantic to the Orient. Los Angeles is the commercial and social metropolis of the Southwest, including Southern California, Southern Nevada and Arizona. It also does a large and increasing trade with Northern Mexico. The two most important products of the country surrounding Los Angeles are citrus fruits and petroleum. The annual value of the orange and lemon output of this section is nearly $40,000,000. These fruits are marketed under a thoroughly organized co-operative system of distribution. Los Angeles is the central distributing point for the most important petroleum fields in the world, with an annual output aggregating about $40,000,000. There are half a dozen beet sugar factories in the country tributary to Los Angeles, with a total output of over $10,000,000. Other important products of the surrounding country are hay, vegetables and deciduous fruits, and grain. A statement issued by the Los Angeles Chamber of Commerce estimates the total value of the products of the section immediately tributary to Los Angeles at $250,000,000. This includes miscellaneous manufactured products to the value of $100,000,000. Los Angeles is rapidly becoming an important manufacturing city, possessing great advantages in the way of mild climate, freedom from labor troubles, and cheap fuel in the shape of crude petroleum, and electric power, derived from mountain streams.

One of the remarkable developments that has taken place during the past few years in the section tributary to Los Angeles is the reclamation of a large portion of the Colorado desert, known now as the Coachella and Imperial Valleys, some of which is several hundred feet below sea level. By irrigation from the Colorado river this arid expanse has been transformed into a wonderfully productive garden, resembling in many respects the valley of the Nile in Egypt. Besides early fruits, alfalfa, hay and cattle, and other agricultural products, there has of late been introduced with great success the cultivation of cotton, including the finest grades of Sea Island and Egyptian cotton. This promises within a few years to be one of the important cotton producing sections of the world. (See Imperial Valley.)

Two of the most important projects undertaken by Los Angeles during the past decade, and now approaching completion, are the aqueduct and the harbor. The Los Angeles aqueduct, on completion, will be the longest aqueduct in the world. It derives its supply from the snow-clad slopes of Mt. Whitney, the highest mountain in America, in Owens Valley, 240 miles from Los Angeles. The work will be completed early in 1913, below the estimated cost of $24,500,000. In addition to furnishing an ample supply of domestic water for a city of over a million population, this aqueduct will irrigate hundreds of thousands of acres of fertile land surrounding the city. Not only this, but it will develop 120,000 horse power of electrical energy. It is estimated that the accumulated earnings from the sales of power at the end of 24 years will alone be sufficient to pay the total cost of building the aqueduct.

Los Angeles harbor is guarded from the rare storms of the Pacific by a breakwater two and one-half miles long, built by the United States Government at a cost of $3,500,000. Active work is now proceeding on the further dredging of the harbor, construction of wharves, and warehouses. The plans call for an ultimate depth of 36 feet of water in the outer harbor at low tide. The city owns a frontage on the harbor, where it will erect municipal wharves, and will run a municipally owned railroad from the city to the water-front. Goods will also be shipped and delivered by automobile trucks, running on a wide, level highway. With the opening of the Panama Canal an immense commerce is expected to seek wharfage facilities in Los Angeles harbor. Already representatives of half a dozen steamship lines operating to the Atlantic Coast, Europe, South America, Hawaii, and the Orient have visited the harbor, seeking to make arrangements for calling at San Pedro as soon as the Panama Canal is completed. The harbor projects under construction in May 1912 include 21½ miles of municipal wharfage, besides a large area of wharfage under private ownership. Los Angeles harbor is absolutely safe, and in any weather may be safely entered by vessels under their own power.

The growth of Los Angeles has been remarkable. The census of 1880 gave it a population of 11,311. The census of 1910 gave it 319,198. In May 1912, a conservative estimate of the population was 400,000.

Harry Gurley,
Assistant Secretary, Chamber of Commerce.

Lose, George William, clergyman and author: b. Pleasant Unity, Westmoreland County, Pa., 28 Sept. 1852; was graduated Capital University, Columbus, O., 1871, and from the theological seminary of same institution 1874. Entered the Lutheran ministry and held several pastorates in Ohio and Pennsylvania. Editor of several Lutheral periodicals and author of many books, including 'Esther and Other Poems' (1883); 'The Triumph of Faith' (1888); 'The Lives of the Twelve Apostles' (1888); 'From Darkness to Light' (1898); 'The Pace that Kills' (1905); 'Ralph the Orphan' (1906); 'Bread Upon the Waters' (1908); 'The Secret of Happiness' (1909), etc.

Lossing, lŏs'ĭng, **Benson John,** American historian and engraver: b. Beekman, Dutchess County, N. Y., 12 Feb. 1813; d. near Dover Plains, N. J., 3 June 1891. In 1826 he was apprenticed to a watchmaker in Poughkeepsie and subsequently entered into partnership with his employer, but in 1835 relinquished the business, and became joint owner and editor of the 'Poughkeepsie Telegraph.' He soon after settled in New York as an engraver on wood, and at the same time edited and illustrated the 'Family Magazine.' His connection with his newspaper enterprises in Poughkeepsie, however, continued until 1841. That year appeared his 'Outline History of the Fine Arts,' followed in 1847 by an illustrated work, 'Seventeen Hundred and Seventy-Six,' and in 1848 by 'Lives of the Signers of the Declaration of Independence.' His 'Pictorial Field Book of the Revolution' was issued in numbers in 1850–2, with more than 1,000 illustrations by himself. In the preparation of this work, which is remarkable for the minute and accurate information which it conveys, the author traveled at different times upward of 9,000 miles, visiting every important battlefield of the Revolution, and making sketches on the spot. Among other works are: ‘Illustrated History of the United States for Schools and Families’ (1854); ‘Our Countrymen, or Brief Memoirs of Eminent Americans’ (1855); ‘Primary History of the United States’ (1857); ‘Mount Vernon and its Associations,’ illustrated by himself (1859); ‘Life and Times of Philip Schuyler’ (1860); ‘Life of Washington’ (3 vols.) (1860); ‘Lives of the Presidents’; ‘Pictorial Field Book of the War of 1812’ (1868); ‘The Civil War in America’ (1866–8); ‘The American Centenary’ (1875); ‘Cyclopedia of United States History’ (1881); ‘Compendious History of the Commonwealth of New York’ (1887).

Lost Cause, The, a phrase which first became current as the title of a history of the Civil War (1886) by E. A. Pollard. It is used as an expressive designation for the purposes and aims which the Southern people, through the war, vainly sought to realize in the permanent establishment of the Confederate States of America.

Lost Chord, The, title of poem written by Adelaide A. Procter. It was first printed in ‘Household Words,’ and appeared again in her collection of ‘Legends and Lyrics’ (1858). The verses were set to music by Sir Arthur Sullivan, whose spirit was so attuned to that of the poet that words and music, both sounding a strain of grandeur, intellectual and emotional, may be regarded as mutually interpretative.

Lost or **Hidden Island,** an appellation anciently applied to Cephalonia, early navigators often being unable to find it on account of its diminutive size. The name also has been given to islands in different parts of the world that once discovered have disappeared or have not been found again.

Lost Pleiad, plē′ăd, a star of the Pleiades constellation which tradition says was once visible, being the seventh of that cluster. Only six stars are now to be seen with the naked eye. Probably the origin of the story is less astronomical than mythological. The legend figures in poetry and in art, a poem by Letitia Landon and a painting by Thomas Buchanan Read each bearing the title.

Lost Property, strays and waifs excepted, may be retained by the finder with impunity, after proper means have been taken to advertise it; and if it cannot be conveniently preserved without hazard he may dispose of it if not claimed. If, however, the loser can identify his property he has a right to restitution, and a third party purchasing lost property from the finder must restore it to the owner, if called upon, and may proceed against the seller for satisfaction. The owner of lost movables must not only prove that they once belonged to him, but that he lost possession either by the fraud of some other party, or in such a way that the ownership still remained with him. The finder's «special property» in his find makes his title good against all save the real owner; the most striking exception is in the case of treasure-trove, that is, hidden valuables, of which, in England, a share goes to the crown, to which notice of such finding must be made. In the United States the law is less clear as to treasure-trove; but it is distinguished from other found property in that the finder has not so good a title as the owner of land in which valuables are found, whereas the finder's title to property found in dwellings, and especially in stores and other semi-public places, is better than that of the owner of the premises. A derelict (q.v.) is distinguished from lost property in that it passes from possession of the owner with his knowledge and consent. Lost property at sea is governed by peculiar principles. The limitation is one year, within which time the possessor may recover property upon the payment of expenses of the finder and of the remarkably heavy percentage of its value called salvage. There are certain cases in which a jury will construe the retention of lost property into larceny. If the finder knows the owner, or can readily discover him, the taking with the intent to keep will amount to larceny. But the more common ground for action in America is detinue, that is, the unlawful retention of property. Obviously there is no recourse if the property detained be of such a character that it cannot be identified.

Lost River, a short stream in the northwestern part of West Virginia, which disappears from view in one part of its course. It passes for some distance along underground channels but reappears again.

Lot, according to the book of Genesis, the son of Haran, and the nephew of Abraham. In order to avoid dissensions between his followers and those of Abraham, he went east into the plain of Jordan, toward Sodom, while his uncle dwelt in Canaan. Having been taken captive by some marauders (styled kings in Gen. xiv.), Lot was delivered by Abraham. Having received two angels into his house in Sodom, an attack was made upon it by the inhabitants, who were struck blind, and the impending destruction of the city was announced to Lot. He escaped with his family; but his wife, looking back «became a pillar of salt.» The name «Lot's wife» is still given to a detached pillar about 40 feet high, on the Jebel Usdûm, a height near the Dead Sea.

Lot (ancient *Loda* or *Olitis*), **France,** one of the largest tributaries of the Garonne River, rises at Mount Lozère, one of the Cevennes, near Mende, department of Lozère. It flows west by south across the departments of Lozère, Aveyron, and Lot, and joins the Garonne at Aiguillon, in the department of Lot-et-Garonne. Total course about 250 miles, of which 180 miles, commencing at Entraigues, are navigable.

Lothair (lō-thär′) **I.,** Roman emperor, eldest son of Louis-le-Debonnaire: b. about 795; d. Prüm, Prussia, 29 Sept. 855. He became associated with his father in the government of the empire in 817 and was crowned and named King of the Lombards in 820. On his father's death Louis and Charles, his brothers, joined their forces and defeated him at Fontenay in June 841. In 843 the three brothers concluded the noted treaty of Verdun, by which Lothair retained the title of emperor, with Italy, and some French provinces beyond the Rhine and the Rhone. Charles then became king of France, and Louis received a tract of country bordering on the Rhine.

Lothair II., called THE SAXON, Roman emperor: b. about 1060; d. near Trent 4 Dec. 1137. He became duke of Saxony in 1106 and was elected king of Germany in 1125 and crowned by Pope Innocent II. in 1133.

Lothair, a novel by Benjamin Disraeli, published in 1870. The scene of this extravagant, but remarkable, story is laid chiefly in England about the period of its publication. The hero, Lothair, a young nobleman of wide estates and great wealth, has been surrounded by a Protestant atmosphere. When, in accordance with his father's will, he goes to Oxford to complete his education, his other guardian, Cardinal Grandison, determines to bring him into the Roman Church. The story is a graphic description of the struggles of rival ecclesiastics, statesmen, and leaders of society to secure the adherence of the young nobleman.

Lo'throp, Amy. See WARNER, ANNA BARTLETT.

Lothrop, Harriet Mulford Stone, «MARGARET SIDNEY,» American writer for young people: b. New Haven, Conn., 4 Oct. 1844. She was married to the Boston publisher, D. Lothrop, in 1881, and was founder and president of the National Society of the Children of the American Revolution. Among her numerous publications, mainly for young people, may be cited: 'The Five Little Peppers' series (1882–1903); 'So As by Fire' (1881); 'The Pettibone Name' (1883); 'The Golden West' (1885); 'The Minute-Man' (1886); 'Dilly and the Captain' (1887); 'Little Maid of Concord Town' (1898); 'The Judge's Cave: a Romance of the Days of Regicides'; etc.

Loti, Pierre, pē-är lō-tē. See VIAUD, LOUIS MARIE JULIEN.

Lo'tion, a wash, solution, or medicinal mixture for external application to the body; usually a liquid remedy, consisting principally of water, as a menstruum, and applied to circumscribed portions of the skin, or of the mucous surfaces. Lotions are either cooling, stimulating, astringent, soothing, or sedative. Water combined with spirit or vinegar is an example of the first. The spirit is added to the water in the proportion of half an ounce and upward to the half-pint. The lead lotion is at once cooling and astringent. A good stimulating lotion is procured from a mixture of water with a third or a half of its bulk of spirit of wine, which is applied to the skin by means of lint, and covered to prevent evaporation. Astringent lotions are formed by adding from 1 to 10 grains of sulphate of zinc or of white vitriol to an ounce of very cold water, having other astringents in solution. Soothing lotions consist of the various preparations of opium, of the decoction of poppies, hemlock, etc., and prussic acid is employed in the preparation of sedative lotions. Stimulating lotions are applied to indolent ulcers and tumors, and sedative and narcotic mixtures are employed to alleviate pain.

Lotophagi, lō-tŏf'ạ-jī. See LOTUS-EATERS.

Lot'ta. See CRABTREE, CHARLOTTE.

Lotter (lŏt'tĕr) **Family,** a family of printers in Germany, the founder of which, Melchior Lotter, born at Aue, appeared in Leipsic about 1491. There his publications of breviaries and missals brought him reputation, which his larger enterprises extended. He published: 'Persius' (1512); 'Horatii Epistolæ' (1522); 'Lutheri Tessaradecos Consolatoria pro Laborantibus' (1520); etc. One of his innovations was the reservation of Gothic types for German and use of Roman for Latin. He is supposed to have given at least secret sympathy and aid to the Reformation. His son, Melchior, who died about 1540, was the original printer of Luther's Bible (1522–4), and was succeeded by Hans Lufft (q.v.). His publications also included various works of Luther, Melanchthon, and other writers.

Lot'tery, a public gambling scheme, by which, for a valuable consideration, one may by favor of the lot obtain a prize of a value superior to the amount or value of that which he risks. In its best and most frequent application, the word describes those schemes of this nature which are conducted under the supervision and guaranty of government, and the proceeds of which are devoted to public objects. Almost all modern states have, at some period of their history, employed lotteries as a means of revenue. But though they supply a ready mode of replenishing the public treasury, they have always been found to exert a mischievous influence upon the people. The poor are invited by them rather than the rich. They are diverted from persistent labor and patient thrift, by the hope of sudden and splendid gains; and as it is the professed principle of these schemes to withhold a large part of their receipts, a necessary loss falls upon a class which of all in the community can least afford to bear it. Between the years 1816 and 1828 the French government derived from lotteries an annual income of $2,400,000. Some years later the government suppressed them, and in January of the next year $110,000 more were found to be in the savings banks of Paris alone than in the same month of the preceding year. In several European states government lotteries are still maintained. They have became an almost indispensable source of revenue; and they are defended by the argument that as the passion for play is irrepressible among the people, and their money would otherwise be invested in foreign or in secret and less fairly managed schemes, the state may well assume the conduct of lotteries at home; that under its supervision the evils attendant upon them are diminished, and their earnings are devoted to the public welfare. There were lotteries in ancient Rome and in England as early as 1659.

In the United States, the lottery has been from the earliest settlement of the country a familiar means of raising funds, which in this country could have been secured in no other mode so easily if at all. The Virginia company derived a large profit from English lotteries, and the influence of them extended gradually to the eastern colonies; for it is reported that an assembly of ministers at Boston in 1699 denounced the lottery as «a cheat,» and its agents as «pillagers of the people.» Generally, however, lotteries enjoyed a fair reputation, and certainly were soon extensively employed throughout the country. In the 18th century they were extraordinarily popular in America. Legislatures authorized lotteries for every species of public improvement, for the building of churches and colleges, for the repair of losses to individuals by fire and otherwise; for example, Faneuil Hall, after the fire of 1761, was rebuilt by lottery. The Continental Congress tried to raise money by lottery in 1777.

In 1833 a society was formed in Pennsylvania which advocated their suppression. In July 1834 the society issued an address to the public, setting forth its objects and views. It is to the efforts of this society that we should mainly attribute the action of most of the States in prohibiting the further establishment of lotteries. Where they are not especially authorized (and in some States the constitution expressly forbids the legislature to authorize them), the parties concerned in them are, in nearly all the States, subject to the imposition of heavy penalties. There exist in the State reports many cases where the provisions of State statutes concerning lotteries have been construed by the courts, but these decisions are necessarily of a particular character, and no important general principles can be derived from them. In Tennessee and Virginia, the acts abolishing lotteries have been by express decisions pronounced constitutional. In Massachusetts, a clause in such an act authorizing a search for tickets provided for the purpose of drawing a lottery is not held to be inconsistent with that article of the bill of rights which declares that every subject has a right to be secure from all unreasonable searches and seizures of his house or person. In New York and Pennsylvania lotteries are declared to be public nuisances, and they may therefore be indicted as such. The schemes known as art unions are held to be lotteries by express decisions. In the language of the court in New York: «These associations distribute a small number of prizes among a great number of persons. The prizes and blanks are drawn in the same manner as in other lotteries. The intention of these schemes is to sell works of art for more than they can be sold for at private sale, and this is to be brought about by an appeal to the universal passion for playing at games of chance. They have all the attributes and elements of lotteries.»

The sums annually employed by Americans in lottery speculations probably amounted to hundreds of thousands. The last lottery supported by governmental encouragement was the Louisiana State Lottery. An Act of Congress passed in 1890 attempted to crush it by forbidding it the use of the United States mails, which act compelled its removal to Honduras, where in 1903 it was still in existence, and thousands of tickets for this lottery were sold monthly in the United States, particularly on the Pacific Coast where as late as November 1903 the daily newspapers issued «extras» giving the winning numbers in the drawings of the Honduras company

Lot'to, a game having its origin in Italy but now played occasionally in other countries. It is played on boards, divided in 27 small squares, arranged in three horizontal rows; five squares in each row are marked with numbers between 1 and 90, four of the squares being left blank. Each person playing is provided with a board upon which he covers the space marked with the particular number called out by the dealer, who draws the counters from a bag. The player who first covers all the five numbers on any horizontal row is declared the winner.

Lo'tus, a popular name for a large number of unrelated plants, and also a generic name for certain plants of the natural order *Leguminosæ*. The genus contains between 50 and 100 species of herbs or sub-shrubs common in the temperate zones. They have trifoliate leaves; pea-shaped, yellow, red, or white flowers, generally in axillary umbels; and linear or oblong pods. The best known species are probably *L. corniculatus* and *L. tetragonoglobus*, the former popularly known as bird's-foot trefoil and babies' slippers, the latter as winged pea. The former is a perennial often planted in dry soils for ornament and for forage; the latter, an annual whose young pods are eaten like string-beans, and the ripe seeds used as a substitute for coffee.

As a popular name, lotus is applied to various water-lilies, especially to certain African and Asiatic kinds, which were held to be sacred to national deities, and were also symbolical of the world, the residence of the gods and of beauty. The fruits of several plants known by this common name have been used for food; for instance, *Zizyphus lotus*, a close relative of but inferior to the jujube (q.v.), *Celtis australis*, the hackberry, *Nitraria tridentata*, *Rhamnus lotus*, and *Nelumbo lutea*, an American plant also known as water chinquapin and yellow water-lily.

The date, plum or persimmon is sometimes called lotus from the specific name of one of its species, *Diospyros lotus*, which by some writers is supposed to be the plant whose fruit was eaten by the fabled lotus-eaters, and whose juice made into wine caused these people to forget their native land. In this connection other plants have been similarly designated; for instance the blackberry and *Zizyphus lotus* mentioned above.

Lotus-eaters (Latin *Lotophagi*), in ancient Greek legends a people on the north coast of Africa who lived on the fruit of the lotus-tree. According to Homer they received Ulysses and his followers hospitably, but the sweetness of the fruit induced such a feeling of happy languor that they forgot their native land and ceased to desire to return to it, their sole object being to live in delicious dreamy idleness in Lotusland. See LOTUS.

Lotze, Rudolph Hermann, German philosopher and physiologist: b. Bautzen, Saxony, 21 May 1817; d. Berlin 1 July 1881. He studied philosophy and medicine at Leipsic and in 1842 was appointed extraordinary professor of philosophy in that University, and in 1844 ordinary professor in Göttingen. In 1881 he filled the same chair in Berlin. His philosophical position is that of a teleological idealist, and he makes metaphysics to be destitute of all independent existence, apart from ethics. The Universe has its cause in the notion of the Good, which underlies all the phenomena and activities of the world. His position as a teleologist is the same as that of Asa Gray, and while allowing that mechanism obtains in the movements of the universe he denies that this excludes the possibility of creative design. Lotze is, however, considered to have done his most original work in the domain of psychology. He teaches that our space-consciousness is built out of the distinctive, non-spatial sense-attributes, which vary according to the locality of the sense-organs stimulated. Among his works are: ‘Metaphysik’ (1841); ‘Logik’ (1843); ‘Mikrokosmus’ (1856–64); and ‘Geschichte der Aesthetik in Deutschland’ (1868).

Loubat, Joseph Florimond, zhō-zĕf flō-rĭ-mônd loo-bä, Duc de, French author and philanthropist: b. New York 21 Jan. 1831. He was graduated from the University of Paris and has been a liberal giver to public institutions, among his benefactions of this character being a gift of $1,000,000 to Columbia University, including valuable books and MSS. He has likewise given much to the Roman Catholic Church, and in recognition of this fact received his title of Duc de Loubat from Pope Leo XIII. in 1893. He has written: ‘Narrative of the Mission to Russia in 1866 by G. V. Fox’; ‘Medallic History of the United States.’

Loubet, Emile, ā-mēl loo-bā, French statesman: b. Marsanne (Drôme) 1838. He was graduated in law at Paris, in 1865 was admitted to the bar at Montélimar, attracted attention by his legal ability, became counsel for the Paris, Lyons, and Mediterranean railway, in 1869 was elected conseiller d’arrondissement, and 4 Sept. 1870 was chosen mayor of Montélimar. Elected in 1871 to the general council of the Drôme, of which he afterward (1885) became president, he was returned to the Chamber of Deputies for Montélimar in 1876, where he served with the Republican left until 1885. In 1885 he entered the Senate for the department of the Drôme, and from December 1887 until April 1888, when he retired with his colleagues of the ministry, filled with much credit the post of minister of public works in the Tirard cabinet. He was chairman of the finance committee of the Senate in 1890, chairman of the customs committee in 1893; and on 29 Feb. 1892 was made premier by President Carnot. His cabinet, in which he held the portfolio of the interior, lasted until November of that year, when its retirement was caused by attacks on its supposed laxity in the prosecution of the Panama case. In 1896 he was chosen president of the Senate. Upon the sudden death of President Faure (16 Feb. 1899), the National Assembly met in congress (18 February) and elected Loubet president of the Republic on the first ballot. His position in politics is that of a moderate Republican, without the tendency to Radical views sometimes ascribed to him. He has been not only a skilful administrator, but a close student of economic questions. He is a protectionist, though not of the extreme type, and an advocate of economy in finance, having made an able speech on financial reform in 1895. His administration as president has done much to strengthen the Republicans, and the Monarchist party has almost entirely disappeared as a serious factor in national affairs. Among the events of his term were the trial of Captain Dreyfus at Rennes, the strike of the miners at Montceau and of the dock-workers at Marseilles, and the enforcement of the association’s law, with the attendant disturbances. In 1906 he was succeeded in the Presidency by Clément Armand Fallières (q.v.). See France, *History*.

Loudon, low’dôn, **Fort,** a name given to two forts built during the Colonial period, and intended for defense against the Indians. One built in 1750, was in Loudon County, Tenn., on the Tennessee River. An Indian massacre took place here a few years after the erection of the fort. The other Fort Loudon was erected in 1752, near Winchester, Va. It was a square building with four bastions, mounting 24 guns. It was large enough to accommodate nearly 500 men.

Loughead, lō’hĕd, **Flora Haines,** American novelist and journalist: b. Milwaukee, Wis., 12 July 1855. She was graduated from Lincoln University, and was married in 1875 to C. E. Appony, and in 1886 to John Loughead, a journalist. She has done much journalistic work in Chicago, Denver and San Francisco, and is the author of ‘The Libraries of California’ (1878); ‘The Man Who Was Guilty’ (1886); ‘Handbook of Natural Science’ (1886); ‘Quick Cooking’ (1890); ‘The Abandoned Claim’ (1890); ‘The Man from Nowhere’ (1892); ‘Santos’s Brother’ (1892); ‘A Crown of Thorns’ (1892); ‘The Black Curtain’ (1897); ‘The San Franciscan’; and of several plays.

Louis, loo’ĭs (Fr. loo-ē), called ‘The Child,’ king of Germany: b. 893; d. 911. He was the son of the Emperor Arnulphus, and succeeded him in 899. During his nominal kingship the government was mainly conducted by Archbishop Hatto of Mainz. At this time the empire was constantly ravaged by the Hungarians. He was the last prince in Germany of the Carlovingian race.

Louis I., surnamed Le Debonnaire, Roman emperor: b. 778; d. near Mainz, Germany, 20 June 840. He was a son of Charlemagne, was early appointed by his father King of Aquitania, and in 813 was named joint-regent of France, of which, in the following year, he became sole sovereign, as well as Emperor of the West. In 817 he divided his dominions among his three sons, and thereby gave rise to disturbances and contests which lasted during the whole period of his reign. In 829, in consequence of the solicitations of his second wife, Judith of Bavaria, who had borne him a son, Charles the Bald, he made a new division of the empire. In 830 the brothers Lothair and Pepin combined against their father, took him prisoner, charged their stepmother with adultery, and shut her up in a monastery. The design of Lothair to make himself sole sovereign having been discovered, the diet of Nimeguen obliged him to submit at discretion. Strife continued for the rest of Louis’ life. In 837 Louis made a new division in favor of Charles, who obtained Neustria in addition to Aquitania. Though not without good qualities Louis had neither the statesmanship nor decision necessary for ruling so large an empire. He was succeeded as emperor by Lothair, to whose protection he had recommended his favorite son Charles.

Louis II., Roman emperor: b. about 822; d. Brescia 13 Aug. 875. He was the son of Lothair I., was made king of the Lombards in 844, and became emperor, in succession to his father, in 855.

Louis III., Roman emperor: b. about 880; d. about 924. He was the son of Boson, king of Provence, and Ermengarde, daughter of the Emperor Louis II. He succeeded his father on the throne of Provence at the age of 10, and in 900 contested the imperial throne with Berengar I., who, having surprised him at Verona, deprived him of his sight.

Louis IV., surnamed the BAVARIAN, Roman emperor: b. 1286; d. near Munich 11 Oct. 1347. He was the son of Louis the Severe, Duke of Bavaria, and succeeded his father in the dukedom, and was elected emperor in 1314. Frederick le Bel of Austria was also chosen at Cologne by another party of electors, and a war between the rivals ensued. Frederick was taken prisoner and only gained his liberty by renouncing his claims. Pope John XXII. then, in 1322, issued his bull of deposition against Louis, and the latter, appealing to a general council, went to Italy, where he declared the deposition of John and set up Peter de Corbiere as pope under the name of Nicholas V., by whom he was crowned at Rome. In 1328 the German electoral princes in a council at Rhense announced that the emperor's title to the German and imperial crowns were derived from his election by them and required no further sanction from the pope, the validity of which proceeding was not recognized by the Papacy.

Louis I., king of France. See LOUIS I., Roman emperor.

Louis II., surnamed LE BÈGUE (the Stammerer), king of France: b. 846; d. Compiègne, France, 10 April 879. He was the son of Charles the Bald, was crowned King of Aquitaine in 867, and succeeded his father on the throne of France in 877. He was obliged to deliver up Provence to Boson, by whom it was erected into a kingdom. His children, Louis and Carloman, divided the kingdom between themselves and a posthumous son, afterward known as Charles the Simple.

Louis III., king of France: b. about 863; d. 822. He was the son of Louis II., and the brother of Carloman, with whom he divided the rule of the kingdom. He defeated Hugh the Bastard, son of Lothaire, marched against Boson, king of Provence, and successfully opposed the Normans at Saucourt, a battle recounted in the famous German poem, the 'Ludwigslied.'

Louis IV., surnamed D'OUTREMER, king of France: b. 921; d. September 954. He was the son of Charles the Simple and became king in 936, on the death of Rudolph of Burgundy. He invaded Normandy, but was defeated and taken prisoner in 944. He was set free the next year after being obliged to concede Normandy to Richard, son of Duke William, and Laon to Hugh, father of Hugh Capet.

Louis V., surnamed LE FAINÉANT (Do Nothing), king of France: b. 966; d. May 987. He was the last French monarch of the Carlovingian dynasty. In spite of the name conferred upon him he was an active ruler. He succeeded his father Lothaire in 986, and soon after becoming king took the city of Rheims and was preparing to march to the assistance of the Count of Barcelona, hard pressed by the Saracens, when he is said to have been poisoned by his queen.

Louis VI., surnamed LE GROS (the Fat), king of France: b. about 1078; d. 1 Aug. 1137. He was the son of Philip I., with whom he was associated in the government in 1100, and whom he succeeded in 1108. His reign was greatly disturbed by contests with the Normans, and by feuds among his vassals. He quarreled with Henry I. of England, and thus was begun the struggle between the English and the French, which continued three centuries. He was ably counseled by his minister, Abbé Suger. Consult: Luchaire, 'Louis VI. le Gros' (1889).

Louis VII., called LE JEUNE, king of France: b. about 1120; d. 18 Sept. 1180. He was the son of Louis VI., and succeeded him in 1137. He contested with Pope Innocent II. the right of presentation to benefices, and was excommunicated by Innocent and his kingdom placed under interdict. By the persuasions of St. Bernard, Louis embarked on the Second Crusade, but was defeated by Saladin, and while returning to Europe, was captured at sea by the Greeks, but afterward rescued by Roger, king of Sicily. His divorced queen, Eleanor of Aquitaine, married Henry of Normandy, afterward Henry II. of England, bringing with her as dowry the provinces of Poitou and Guienne. This caused a long war between England and France. Consult: Luchaire, 'Etudes sur les Actes de Louis VII.' (1885); Hirsch, 'Studien zur Geschichte König Ludwigs VII. von Frankreich' (1892).

Louis VIII., surnamed THE LION, king of France: b. 1187; d. Montpensier, Auvergne, France, 8 Nov. 1226. He was the son of Philip Augustus of France and married Blanche of Castile in 1200. Accepting the offer of the English crown made him by the English barons in 1216 he landed in England, took Rochester and Winchester and received the homage of the barons at London. On the death of John he was excommunicated by the legate and withdrew to France in September 1217. He succeeded his father in 1223, and soon regained most of the English possessions in France. In 1226 he led a crusade against Raymond, Count of Toulouse, and the Albigenses; took Avignon after a three months' siege, and laid waste Languedoc. Consult: Petit Dulaillis, 'Etude sur la Vie et la Regne de Louis VIII.' (1894).

Louis IX., called SAINT LOUIS, king of France: b. Poissy, France, 25 April 1214; d. near Tunis, Africa, 25 Aug. 1270. He was the son of Louis VIII. and Blanche of Castile and came to the throne on the death of his father. Being only in his 12th year he was placed under the guardianship of his mother, who was made regent of the kingdom, and was declared of age in 1236. In 1243 Louis defeated the English in several engagements, and a truce for five years was concluded. Having made a vow, in the event of recovering from a dangerous disease, to march against the infidels in the Holy Land, he in 1248 embarked at Aigues-Mortes with an army of 50,000 men. This expedition proved disastrous and Louis with his army was captured by the Saracens. Damietta, which had been taken by the French, was demanded as the price of the monarch's freedom, and a vast ransom was also claimed for his followers. In 1254 he returned home, and in the interval Queen Blanche, who had ruled the kingdom well in his absence, had died. Louis now turned his attention to the administration of the law. The subjects were now suffered to appeal from the decision of their lords to four royal tribunals, and men of learning were introduced into the parliament. Louis also diminished the taxes. The code of laws known as the 'Etablissements de St. Louis' is the work of some unknown compiler. In 1270 he undertook a crusade against Tunis, in the midst of which enterprise he died. He was canonized by Boniface VIII. in 1297, and the Sieur de Joinville wrote his life. Consult: Langlois, 'Saint Louis' (1887); Berger, 'Saint Louis et Innocent IV.' (1893); Lecoy de la Marche, 'La France sous Saint Louis' (1893); Berger, 'Histoire de Blanche de Castile' (1895); Sepet, 'Life' (1903).

Louis X., surnamed Le Hutin (the Quarreler), king of France: b. Paris 1289; d. Vincennes 4 June 1316. Through his mother he inherited the kingdom of Navarre in 1305, and in 1314 he succeeded Philip the Fair, his father, on the throne of France. His posthumous son, John I., survived but a few months, and Louis' brother then succeeded as Philip V.

Louis XI., king of France: b. Bourges, France, 3 July 1425; d. Plessis-les-Tours, France, 30 Aug. 1483. He was the son of Charles VII., but in all respects very unlike him, and in 1440 he left the court and headed an insurrection against his father. Charles pardoned his son but the latter soon entering into new conspiracies was obliged to take refuge in Burgundy, and lived there five years in a dependent condition. On reaching the throne after the death of his father, in 1461, he dismissed the former ministers and surrounded himself with obscure men, having neither character nor talents to recommend them. In all his acts a crooked policy and sinister views were evident. Pretending to reconcile contending parties, he secretly instigated them against each other, and when negotiating with a foreign government he bribed its messengers and established secret correspondences with them. He carried on a war with Charles the Bold, Duke of Burgundy, which lasted 1465–72, and on the death of Charles in 1477 at the battle of Nancy, he joined Burgundy to France. In 1481 he united Anjou, Maine and Provence to the kingdom. Consult: See, 'Louis XI. et les Villes' (1893); Kitchin, 'History of France,' Vol. I. (1885).

Louis XII., surnamed the Father of His People, king of France: b. Blois, France, 27 June 1462; d. 1 Jan. 1515. He was the son of Charles, Duke of Orleans, and on coming to the throne in 1498 he pardoned all who had wronged him previously. His reign was continually disturbed by war. He subdued the Milanese, Genoa, and Naples; but in 1513 the French were expelled from Italy. Henry VIII. of England, attacking Louis in his own dominion, Louis was obliged to sue for peace after the Battle of the Spurs in August 1513. For his third wife he married the young Princess Mary, sister of Henry VIII., who after his death was married to her first lover, Charles Brandon, Duke of Suffolk. Louis XII. was honest and magnanimous; he was friendly to science, and France prospered under him. Consult: Lacroix, 'Louis XII. et Anne de Bretagne' (1882); Claviere, 'Histoire de Louis XII.' (1890 et seq.).

Louis XIII., king of France: b. Fontainebleau, France, 27 Sept. 1601; d. Saint Germain-en-Laye, France, 14 May 1642. He was the son of Henry IV., whom he succeeded under the regency of his mother, Mary de Medicis. In 1614 he was declared of age and the next year he married Anne of Austria. The realm was now in a very disturbed state. The Huguenots were threatening and a great part of the kingdom rebelled. In 1624 Louis chose Cardinal Richelieu as his prime minister, and the remainder of his reign was to all purposes that of the great cardinal. Under him the Huguenot power was broken, politically, the governmental power centralized and the influence of Austria materially weakened. Consult: Raumer, 'Geschichte Ludwigs XIII. und des Kardinals Richelieu' (1830); Topin, 'Louis XIII. et Richelieu' (1876); Zeller, 'La Minorité de Louis XIII.' (1897). See Richelieu.

Louis XIV., king of France: b. Saint Germain-en-Laye 5 Sept. 1638; d. Versailles 1 Sept. 1715. He was only 5 years old when he succeeded to the throne, but his mother, Anne of Austria, was made regent during his nonage which ended in 1651, when he was 13. Cardinal Mazarin was then prime minister and the French army under the leadership of Condé and Turenne was gaining much glory in the war with Spain and the emperor. But internally the nation was in the throes of a civil war; Mazarin's avarice and the peculations of Fouquet had disgusted the Parisians, who were moreover incensed with Anne of Austria's conduct of the regency and the supremacy of her agent the cardinal. The king and his mother were compelled with the unpopular prime minister to flee from the capital, and the Spanish armies streamed over the northeast boundaries from Holland and held their way victoriously through Champagne and Lorraine. When war broke out between England and Holland Louis threw his strength on the side of the latter; but the conflict was largely confined to the sea, and after a few sea fights the war was ended by the Peace of Breda in 1667. Mazarin had died in 1661, Fouquet was condemned to perpetual imprisonment after being compelled to disgorge his ill-gotten gain, and when the king was asked who was to be referred to on matters of public business he astonished his courtiers by saying «Myself.» And indeed he reigned as absolute monarch to the end of his days. He appointed Colbert to take charge of the public exchequer, and the consequence was a multitude of needed reforms. He had forced the court of Spain as well as Pope Alexander VII. to submit to his personal dictation and make ample reparation for the wrongs suffered by French ambassadors at the hands of Spaniards and Italians in foreign capitals. All Europe was impressed by his bold self-assertion, and his well-known saying «*L'état c'est moi,*» «I am the state,» was felt to be literally true. But his great desire was the attainment of military glory. When a child his chief amusement had been to turn his playmates into soldiers and engage in a mimic war. After his victorious campaign in Holland, closed by the Treaty of Nimeguen in 1678, he was acknowledged to be the leading sovereign in Europe. He had the most numerous, the best drilled, the best equipped army in the world. His diplomacy had triumphed in every court, and the French nation led Europe in art, science and letters, while trade and industry were amazingly flourishing. Louis shone among his ministers, generals and literary courtiers as the sun among the stars, an ideal king, a paragon of learning, strength and wisdom. At Versailles he built himself a palace at a cost of 150,000,000 francs. Here the splendor of his surroundings was the envy and admiration of all other monarchs, great and small. But his wisdom and political sagacity were much criticised when in 1685 he revoked the Edict of Nantes by which the policy of Henry IV. had made certain indulgences to Calvinists of France. By unsheathing the sword of religious persecution he drove away many citizens whose industrial skill and steady lives formed one of the stablest and most precious elements in French national life. Soon after this half of Europe formed a league against France. Holland, Germany and Spain joined their forces in an attempt to humble the overweening arrogance of a monarchy whose greatness was a menace to each of them. In 1688 the dauphin took Philipsburg on the Rhine, but was forced to evacuate and retreat before the overwhelming forces of the allies. The war continued with varied fortunes until the peace of Ryswick, 1697. The death of Charles II. of Spain, the last of the house of Hapsburg (1700), brought on the war of the Spanish Succession. He left his crown to Philip of France, Duke of Anjou, who assumed the title of Philip V., but his claim was disputed by the Archduke Charles, who had the support of the emperor, as well as of Holland and England. In 1704 Prince Eugene and Marlborough routed the French forces at Blenheim, Barcelona surrendered to the Archduke Charles, Marlborough won the battle of Ramillies and in 1708 that of Oudenarde. The fatal defeat of Malplaquet the following year decided the struggle in favor of the allies and the Peace of Utrecht (1713) completed the humiliation of France and added to the power and ascendancy of England. France was, however, saved from dismemberment, mainly through the boldness and vigor of Louis and his counsellors, and the principal foreign conquests of the king were not forfeited. For the two remaining years of his reign the country enjoyed tranquillity. Louis in his declining years expressed regret for the distress he had brought on his well-loved country by his love of foreign conquest and warlike glory. His unworthy private life had some part in rousing the remorse which tortured his last days, and caused him to show that spirit of piety and devotion which Lesage ridiculed as hypocrisy. His mistresses, La Vallière, Montespan, Fontanges, and others had made his court a by-word of scandal. Madame de Maintenon, who was married to him a year after the death of his queen Maria Theresa (1683), was influential in rousing his sense of past licentiousness. In this she was aided by the eloquence of Bossuet.

The reign of Louis le Grand was made brilliant by the great soldiers, sailors, literary men, artists, and men of science who were his contemporaries. His reign has indeed been aptly styled the Augustan or golden age of France. Among his sea commanders were Château-Renand, Duquesne, and Tourville; Vauban was his military engineer; Perault, Mansart and Blondel architects; among his painters were Claude Lorraine, Poussin and Lebrun; among poets and writers of his reign were Corneille, Racine, Molière, among his great preachers were Massillon, Bossuet and Flechier. He was worthy of the title of the Great Monarch for his strong and astute statecraft, the magnificence of his court, his dignity and munificence, and he fixed for the French monarchy that type of absolutism which Balzac has declared to be in France the safest and best foundation on which national greatness was to be developed.

Consult: Voltaire, 'Siècle de Louis XIV.'; Hassall, 'Louis XIV. and the Zenith of the French Monarchy' (1895); and Philippson, 'Das Zeitalter Ludwigs des Vierzehnten' (1879).

Louis XV., king of France: b. Versailles, France, 15 Feb. 1710; d. there 10 May 1774. He was the great-grandson and successor of Louis XIV., and coming to the throne when only five years old, Philip, Duke of Orleans, was made regent. Louis was declared of age in 1723 and married Marie Leczinska, daughter of the king of Poland. The Duke of Orleans died that year and was succeeded as prime minister by the Duke of Bourbon, who was removed in 1725 to make way for Cardinal Fleury, who died in 1743. After the Cardinal's death the king's mistresses, Pompadour and Du Barry, controlled the election of the prime minister and other officers. In 1741 France became entangled in the war of the Austrian Succession against Austria but in 1756 was involved in the Seven Years' war, in which Austria was the ally of France. This was ended by the Peace of Paris in 1763. By this treaty Louisiana and Canada were lost to France. The kingdom was left impoverished at the death of Louis, partly by war and partly through the enormous sums squandered upon the royal mistresses. Consult: De Tocqueville, 'Histoire philosophique du Regne de Louis XV.' (1846).

Louis XVI., king of France: b. Versailles 23 Aug. 1754; d. Paris 21 Jan. 1793. He was the third son of Louis and of Marie Josepha, daughter of Frederic Augustus, king of Poland and elector of Saxony. During the lifetime of Louis XV. he bore the title of Duke of Berri. Amid the corruptions of the French court he kept aloof from licentiousness, was reserved and taciturn, and took most delight in practising some mechanical art, such as lock-making or printing. In 1770 he was married to Marie Antoinette, archduchess of Austria, and four years later became a king by the death of his grandfather. He began his reign with many popular measures tending to alleviate the financial distress under which the country labored, and his appointment of Turgot as minister of finance gave general satisfaction. The people were moreover pleased to see the parliaments again convened (1774), and the king set an example of national economy and retrenchment by the simplicity of his personal life, and the reduction of his retinue. The war of the American Revolution had sent Franklin and Deane to Paris to ask help for the young republic. Louis XVI. was weak enough to take sides with the English colonists against their mother country, and the French and English war cost France an amount of treasure that almost plunged her into bankruptcy. At the same time French enthusiasm, roused in favor of republicanism, caused a feeling to prevail which threatened to endanger the stability of the monarchy. Necker by his attempts at reform and economy so offended the nobility that he was compelled to resign and was succeeded by the reckless and wasteful Calonne. The queen was meanwhile very unpopular, and the affair of the "Diamond Necklace" (q.v.) was made to aggravate public disaffection toward the throne. The notables met in 1787, but rejected a measure for universal taxation which would comprise the notables and clergy of the realm. Calonne, the finance minister, resigned, bankruptcy menaced the nation and Necker was recalled, and suggested the convening of the States-General. The assembly met amid great popular excitement in May, 1789, at Versailles, a series of reforms in public expenditure was begun, and the country was filled with enthusiasm. Necker sought to reproduce on French soil the limited monarchy of Great Britain. Louis proposed concessions, which were coldly greeted, and when he dissolved the assembly, Mirabeau, who sat in the third estate, defied the royal power, and refused, in the name of the people, to obey the mandate of dissolution. So great meanwhile was the excitement and anxiety which reigned in Paris that a national guard was formed with Lafayette for a commander. The king vacillated, dismissed Necker, surrounded Paris with his army and the people rose in a burst of frenzy and sacked the Bastile. The king ordered the approach of the troops on Paris, but to conciliate the people appeared at Hotel de Ville wearing the tricolor. Meanwhile the princes of the blood and the nobles were leaving the country, Necker was recalled, and the king returned to Versailles, but on 5 October the mob took possession of the royal palace there, and compelled the king and the royal family to return with them to Paris, where they were kept strictly guarded in the Tuileries. There they were confined as prisoners till the following year (1790). Necker had fled to Switzerland, Mirabeau, the one hope of the monarchy, had died. The king made an attempt to visit St. Cloud (1791) but was prevented by the mob. He then escaped unnoticed from the Tuileries, but was stopped at Varennes, 150 miles from Paris. The invasion of France by the Prussians and Austrians roused the Parisians to fury. They stormed the Tuileries and massacred the Swiss guard; the royal family were flung into the ancient fortress known as the Temple. The national convention met on 20 September; in December they brought the king to trial on a charge of conspiring to overthrow the constitution and restore the ancient order of things. He was condemned by unanimous vote 5 Jan. 1793 and was guillotined. Consult Bouvet, ‘Histoire de Louis XVI.’ (1825); Jobez, ‘La France sous Louis XVI.’ (1877–93); Beaucourt, ‘Captivité et derniers Moments de Louis XVI.’ (1892); Courian, ‘Louis XVI. et la Révolution’ (1893).

Louis XVII., titular king of France: b. Versailles 27 March 1785; d. Paris 8 June 1795. He was the second son of Louis XVI. and Marie Antoinette; was at first styled Duc de Normandie; and after the death of his elder brother, in 1789, became heir to the throne. With his relatives, in 1792, he was imprisoned in the Temple; after his father's death in the following year was styled king by the Royalists; but being given into the keeping of a shoemaker named Simon, in derision called his tutor, was subjected to brutal treatment, from which he died. The fact of his death was denied by certain impostors, whose claims to his name and to the throne found some supporters. Such claims continued to be urged almost down to the middle of the 19th century, about which time Eleazar Williams (q.v.) a half-breed Indian missionary, born in the State of New York, was led to believe that he was the lost dauphin, he and his friends declaring that he had been delivered from prison and while still very young brought to this country. He died in 1858. Although Williams made little attempt to enforce his own claim, others argued it, and a book was written in its support. But nothing in the nature of historical proof has been established to cast doubt on the actual death of the dauphin as above related. Consult: Hanson, ‘The Lost Prince’ (1854); Bülau, ‘Geheime Geschichten und rätselhafte Menschen,’ Vol. II. (2d ed. Leipsic 1863); Evans, ‘The Story of Louis XVII. of France’ (1893); Chantelauze, ‘Louis XVII., son Enfance, sa Prison, et sa Mort au Temple’ (1895).

Louis XVIII., «Stanislaus Xavier» (given the title of Le Désiré, by the Chamber of Deputies), king of France: b. Versailles, France, 17 Nov. 1755; d. Paris 16 Sept. 1824. As the younger brother of Louis XVI. he was designated Monsieur, his rank in the nobility being Count of Provence. He early showed himself a political marplot, a hinderer of reform, and one of the great obstacles to his brother's success in handling the difficulties of the revolutionary movement. When the king escaped from the guards of the Tuileries (1791), Monsieur was by his side, and while Louis XVI. was seized and taken back to confinement, escaped to the frontier. With his brother, the Count d'Artois, he held court for some time at Coblentz, where he issued animadversions on the revolutionists in France, and seriously complicated the difficulties of the royalist cause by his want of temper and judgment. When the Duke of Brunswick invaded France, Monsieur and the Count d'Artois joined his forces and shared his disasters. On the death of Louis XVI. (1793) the Count of Provence declared his nephew king, and when Louis XVII. died (1795) he took the title of king of France. He wandered from court to court of Europe, and finally settled in England (1807), where he remained until the fall of Napoleon. At last he crossed the Channel and entered Paris (3 May 1814) after an absence of twenty-three years. His reign was inaugurated with the bitter retaliatory measures of the White Terror (q.v.). When Napoleon made his escape from Elba and arrived at Paris (1 March 1815) the unpopularity of the Bourbon restoration was proved by the enthusiasm and devotion of those who flocked to his standard. The king fled from Paris, but, after the battle of Waterloo, was once more restored, entered the capital under the protection of victorious Wellington, and appointed a new ministry with Talleyrand at the head of it. Louis proceeded to disband the army, to exclude from the general amnesty those who came under the head of «rebels,» those who had voted for the death of Louis XVI. and were consequently «regicides,» and those who had received rank and honors from Napoleon in 1815. The rest of his reign was satisfactory neither to Blues nor Reds, and the real stay of the country was the Duc de Richelieu, the successor of Talleyrand. In accordance with the policy of the Holy Alliance the despotic Ferdinand VII. was re-established on the Spanish throne by a French army (1823) and the last year of the king's life was spent in disease, followed by paralysis, which carried off a feeble and illiberal monarch whose only work in life had been to prove that political disquiet in France had not been and was not to be allayed, by the restoration of the Bourbons. Consult Dulaure and Anguis, ‘Histoire de la Révolution depuis 1814 jusqu'à 1830’ (1834–8); Viel Castel, ‘Histoire de la Restauration’ (1860 et seq.).

Louis Philippe, fē-lēp, king of the French: b. Paris 6 Oct. 1773; d. Claremont, near Windsor, England, 26 Aug. 1850. He was the eldest son of Duke Louis Philippe Joseph of Orleans, afterward surnamed Egalité, and of the Princess Louise Marie Adelaide of Penthièvre. In infancy he held the title of Duke of Valois, and in 1785 that of Duke of Chartres. In 1782 his father entrusted the education of Louis Philippe and his other children to Madame de Genlis. Having entered the national guard in 1790, he became a member of the Jacobin Club. In May 1792 he commanded a brigade of cavalry in Luckner's army, rose under Kellerman in September to be lieutenant-general, and did good service in the famous cannonade at Valmy. He next joined the army of Dumouriez, and took part in the victory of Jamappes. Dumouriez had formed a scheme for placing him on the constitutional throne, and being included in the order of arrest directed against Dumouriez, in April 1793 he took refuge within the Austrian territory. After many wanderings he procured the situation of teacher of geography and mathematics in the school of Reichenau, near Coire, where, during eight months, he passed under the name of Chabaud-Latour. In 1796 Louis Philippe, since his father's death, Duke of Orleans, arrived in America, where, in the following year, he was joined by his two younger brothers. The three princes traveled in the United States, and at last took ship for England, where they landed in 1800. The brothers lived above seven years at Twickenham, near London. After the news of Napoleon's downfall the Duke of Orleans set out for Paris, where he was received by Louis XVIII., not without distrust, and in 1814 appointed colonel of hussars. On the news of Napoleon's return he set out for Lyons to assist the operations of the Count d'Artois. After an unsuccessful attempt to hold the northern departments for the Bourbons, he left Lille and set out for England to join his family, who had preceded him. He returned in July 1815 and obtained the removal of the sequestration of his domains which had been imposed by the imperial government. The estrangement of Louis XVIII. from him was, however, increased, and he withdrew in October 1815 to England, but returned to Paris in the following year. After the coronation of Charles X. his relation to the court became more friendly. During the bloody days of 27, 28 and 29 July, the court had entirely forgotten him. Nor during the struggle was his name mentioned in Paris. On the 29th the provisional chamber, on Laffitte's suggestion, resolved to offer him the regency as lieutenant-general of the kingdom. In a sitting of the chamber on 9 August he swore to the reform charter, and ascended the throne as king of the French. Being hated by the extreme Democrats, frequent attempts were made on his life; but during this period France made vast progress in industry and wealth, and the durability of the July throne seemed to be thereby consolidated. But his selfish policy had estranged the European courts, and a loud demand for a change in the electoral system being foolishly opposed by the king and the Guizot ministry, his position in France became extremely precarious. On 22 Feb. 1848 an insurrection began in the streets of Paris. Next day Guizot gave in his resignation; but the insurrection gained in extent and intensity, and neither the command given to the troops on the morning of the 24th to stop firing, nor the abdication of the king a few hours after in favor of his grandson, the Count of Paris, sufficed to lay the storm. Louis Philippe, completely disheartened, unsupported by any administration, and forsaken even by the courtiers, about midnight of 24 February quitted the Tuileries with his family, and fled from Paris, and on 3 March 1848 took up his residence in England, which he never again left.

Louis D'Or, loo'ē dôr (Fr. «golden Louis»), a gold coin formerly current in France. It was first struck in consequence of an edict of Louis XIII. dated 31 March 1640. It was 22 carats fine, and originally was worth 10 livres of the period (equal to 21 francs 33 centimes). Afterward it ranged in value from about $4 to $4.60. In 1810 the louis d'or was replaced by the napoleon of 20 francs, and when the coin was again struck under the restoration the same value (20 francs) was retained.

Louisa, loo-ē'za, queen of Prussia. See Luise, Auguste Wilhelmine Amalie, Queen of Prussia.

Louisburg, loo'is-berg or loo'ē-berg, town of Cape Breton Island in the Province of Nova Scotia; on the coast at the entrance to the Gulf of Saint Lawrence. The earliest mention of English Harbor later called Louisburg is found on Champlain's Map of 1612 and was, in his time, the resort of fishermen mainly from England. It was not until 1713 that Louisburg came into prominence by the removal to it of the French officers and inhabitants from Newfoundland then ceded to England under the Treaty of Utrecht.

The city is chiefly noted for the historical events which transpired in and around it and for the ruins of the fortifications. These fortifications were commenced in 1720 and completed about the year 1744 at a cost to the French Government of 30 millions of livres equal to-day to about 10 millions of dollars. They enclosed an area of about 100 acres and had a circumference of 2½ miles.

On the declaration of war in March 1744 between France and England, Louisburg was the object of an attack by the expedition sent out by the New England Colonies. This was composed of 3,250 men from Massachusetts, 300 from Connecticut, 300 from New Hampshire, and 150 from Rhode Island, supplemented by 14 vessels, carrying 200 guns fitted out by the Provinces, and by Commodore Warren's West Indian fleet of 10 vessels carrying 460 guns beside the captured Vigilante of 64 guns. The siege, begun on 30 April 1745, ended in the capitulation by Governor Duchambon on 16 June.

By the Treaty of Aix-la-Chapelle in 1748, the Island of Cape Breton was restored to France in 1749, and the fortifications at Louisburg were considerably strengthened and a new battery erected at Point Rocheforth at a cost of $5,000,000. In February 1758, two years after war had been declared between France and England, a second expedition, consisting of 22 ships of the line, 16 frigates and 120 transports with 11,000 troops, invested the fortifications and on 27 July the troops under General Wolfe entered the fortress. Thus Louisburg became a possession that settled for all time the future of Canada.

Shortly after the capture the British Government ordered that the great fortress be razed to the ground and to-day only the casements or bomb-proofs remain. The ruins are now being preserved and under the patronage of King Edward VII a memorial tower is to be erected bearing the names of the killed and wounded in both sieges.

Louisburg is now becoming a port of considerable importance, having been established as the eastern terminal port of the Intercolonial railway and used by the Dominion Coal Company and by the Dominion Steel Company as a shipping port for a large portion of their products. See COLONIAL WARS IN AMERICA.

Louiseville, loo'ĕz-vĭl, or **Rivière du Loup,** rē-vē-ä dü loo, Canada, town, capital of Maskinongé County, in the province of Quebec; on Lake Saint Peter, an expansion of the Saint Lawrence River; and on the Canadian Pacific railroad; about 18 miles west of Three Rivers. The mineral springs of Saint Léon, in the vicinity, bring many people to Louiseville. The chief industry is tanning leather, but flour and dairy products are among the manufactures. Pop. about 1,100.

Louisiade (loo-ē-zē-äd), **Archipelago,** in the Coral Sea, southeast of New Guinea; belongs, administratively, to British New Guinea. The largest islands of the group are Southeast (Sudest) Island, Saint Aignan, and Rossel. Southeast Island is about 45 miles long and from 4 to 10 miles wide. Rossel and Saint Aignan each have an area of over 100 square miles. They are all mountainous. Saint Aignan has a peak about 3,500 feet in height. Many of the small islands are of coral formation; and the vegetation is varied and luxuriant. The islands were discovered in 1666 by Torres, and became British possessions in 1888. The majority of the inhabitants are uncivilized, and are of the Papuan race.

Louisiana, one of the United States, bordering on the Gulf of Mexico; one of the largest and most important of the Southern States. The name «Louisiana» was first applied by La Salle in 1683 to the vast territory watered by the Mississippi and its tributaries, which he thus dedicated to King Louis XIV.

It was the fifth State admitted to the Union under the Federal Constitution. It lies between lat. 28° 59′ and 33° N., and lon. 88° 40′ and 94° W. Its extreme length is 300 miles, and extreme width 240 miles, with an area of 48,706 square miles. It is bounded on the north by Arkansas on parallel of 33° to the Mississippi and thence on the parallel of 31° to eastward Pearl River, on south by the Gulf of Mexico, on the west by the Sabine River and a line drawn from it directly north to meet the 33° parallel. Within these limits are included 45,309 square miles of land and 3,397 of water, 637 in rivers and 2,760 in lakes. The State is divided into 59 parishes gradually created from the five original divisions under French and Spanish domination.

Rivers and Lakes.—The Mississippi River in its devious course splits Louisiana in twain with 37,000 square miles on the western bank. With but rare interruptions the river flows through alluvial soils of low elevation requiring the protection of levees. The coast line of the delta and eastward consists of lands little above sea level intersected by small tracts of elevated prairies and low ridges covered with live oak. Northwestward the land rises until in north Louisiana the hills attain the height of 500 feet. Both on the Mississippi and the other river valleys, the highest land is formed by the banks themselves, from which the land slopes away gradually to the marshes. To protect these low-lying lands there have been built at vast expense some 1,500 miles of levees of great strength. These, however, give way occasionally before the mass of waters brought down by the Mississippi in flood, and great damage results. (See LEVEE.) The drainage system of the State is toward the Gulf and mainly through the Mississippi and its tributaries, the Red River and the Ouachita. On the east Pearl River and on the west the Calcasieu River and the Sabine, which divides Louisiana from Texas — each drain small districts. The Red River formerly flowed directly to the Gulf of Mexico. Its old channel is now filled by the Atchafalaya, which has increased so rapidly of late years as to give rise to fears of its becoming the main channel of the Mississippi. The lakes of Louisiana are of three kinds. Those on the coast are shallow estuaries enclosed within the delta, of which the greatest are lakes Pontchartrain and Maurepas. At the entrance to the former is Lake Borgne. A second class is formed by the curved sections of the river which are cut off and silted up as in the smaller rivers by the action of accumulated debris and rafts of driftwood such as are found above Shreveport. These are rapidly disappearing through the removal of the obstructions, and the lands are being reclaimed.

Of the 28,000,000 acres of land in the State only 3,000,000 are in cultivation. Nearly the entire upland is covered by strata of drift or red sandy clays. One thousand nine hundred square miles are alluvial. The soil next the river is the lightest or soundest, the surface of the backlands consists of a peculiarly friable soil known as buckshot to such a depth as to permit of the deepest cultivation and with a high absorptive power which secures crops against drought. South of the Red River the soils are less varied in character, but all are rich in the essential elements of plant food and require only drainage and good culture to produce excellent crops. The land is distributed as follows: Alluvial lands, 13,225 square miles; bluff prairies, 5,739 square miles; oak uplands, 8,103 square miles; long-leaf pine hills, 7,582 square miles; long-leaf pine flats, 2,556 square miles; central prairies, 785 square miles; coast marshes, 7,420 square miles.

Geology and Mineralogy.—The entire State is part of the Mississippi deposit on the bottom of an ancient gulf whose shore touched Cairo, Ill. Its oldest sediments were Cretaceous, now covered except in a few small spots in the northwest. The upland region west of the northern course of the Calcasieu, and of the Washita, is a mass of horizontal Tertiary beds, clays, and clay sandstones. The entire alluvial region and coast swamps, besides much bordering prairie, is Quaternary. Such formations could hardly be rich in minerals, and though some iron ore and low-grade brown coal are found in the Tertiary districts, the only important minerals are rock salt, sulphur and petroleum. The salt is found in the chain of isolated hills known as Islands.

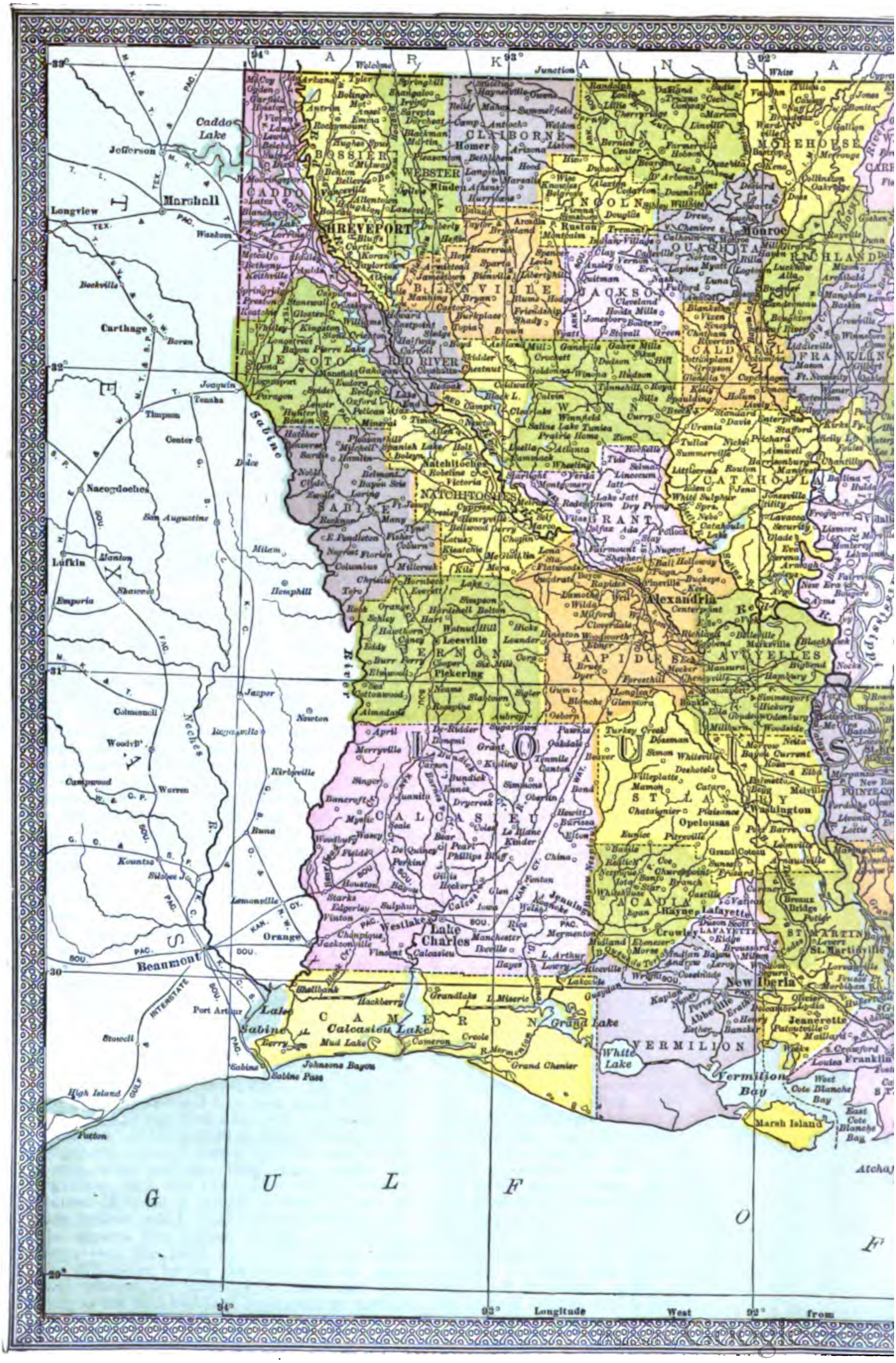
commencing with Petite Anse on the Gulf, and extending to New Iberia. The first workings were at Avery's Island; recently two other mines have been opened and the output will be largely increased. The oil fields in Calcasieu and Saint Martin's parishes give promise of exceeding those of Texas in extent and value of product. The sulphur is also in Calcasieu Parish.

Climate and Rainfall.— Louisiana, ranging from the parallel of lat. 33° to 29° N. is semi-tropical in climate and products. The summer heat reaches 105, and averages 85 for the hottest month; it does not reach zero south of Shreveport, and the coldest month ranges on an average from 45° to 60°, according to location. The gulf vapors make it very equable, the prevailing winds being south and southwest,— that is, from the ocean. There are only three months of frost in the year, the beginning varying from the first of November to the first of December. The rainfall varies from an average of 60 inches a year in the southeastern part, to 50 in the northern. This abundant moisture and the steady warmth cover the State with luxuriant tropical growths, and the magnificent profusion and beauty of its flowers are famous. The magnolia is most familiar as a specially southern product, but the roses, jasmines, oleanders, camellias, etc., are notably beautiful. The orange, fig, and most other semi-tropical fruits will flourish here.

Fauna.— The only large quadrupeds surviving are black bears and a few catamounts in the less accessible forests and swamps. Many deer are found during the winter. The wildcat is not uncommon, and the raccoon and opossum are familiar. The alligator is common to all bayous and ponds. Bird-life is plentiful; it comprises eagles and vultures, pelicans and cranes, beside wild turkeys, geese, and ducks. There is an excellent State game law.

Forestry.—A large proportion of the entire forest wealth of the United States is represented by the immense areas of long- and short-leaf pine. It is estimated that there are standing respectively 26,588 millions of long-leaf pine and 21,628 millions of short-leaf pine, occupying 15,000 square miles of upland. In the swamps are vast forests of red and white cypress, the value of which has only recently been recognized. Other valuable woods which are to be found in large quantities on the bluff lands and inland streams are ash, oak, beech, walnut, and cotton wood.

Agriculture.— From the considerations mentioned, an exceptionally fertile soil, a warm climate with variations from northern highlands to southern coast plains, Louisiana has remarkable natural advantages for a great variety of products, from temperate to semi-tropic. Yet less than two fifths of the soil has been even nominally in farms, and less than one sixth improved; and of the total of $61,272,676 in value of farm crops, $56,395,227, or over eleven twelfths, was in two money crops and two food crops, cotton and sugarcane, corn and rice. This lack of diversification of crops is largely a result of the old slave system, which tended to concentrate attention upon a few staples roughly cultivable by gangs; and the break-up of the system added new difficulties to the old industries for many years without any tendency to create new especially as the land had been exhausted by wasteful cultivation and lack of fertilizing. There are some indications of a change; but the chief feature has been the enormous development of irrigated rice culture, as told below. There has also been a progressive subdivision of farms; the average plantation of 1860 was over 500 acres, the average farm of 1910 was under 90. This does not, however, imply the cessation of large farms; on the contrary, Louisiana is emphatically the State of great plantations outside the ranching States, there being in 1900 over 1,1000 containing more than 1,000 acres each. This is due to the heavy capital needed to carry on the sugar business, which must have a large territory to make fair returns. One result of the growth of the class of colored farmers, besides the cutting up of farms,— their average being 40 acres to 150 for the white farmer,— is the increase of rentals, they being usually too poor and unthrifty to buy. They slightly outnumber the white farmers, but they own only about one seventh of their farms against nearly two thirds owned by the whites, and there are nearly three times as many cash tenants and two and a half times as many share tenants as white. They operate but about one fifth of the farm area, however. In cotton culture, Louisiana has been slower to recover from the Civil War than any other State, having not yet reached the figures of 1860, while several others have immeasurably surpassed them, and it has not greatly grown since 1890. Its product in 1899, though exceeded by six other States, was 44 per cent of the total crop production, being 709,041 bales, valued at $27,004,812. The crop of 1909 was 269,573 bales, which had a farm value of $20,592,580. Sugar, the next crop in value ($14,627,282), is Louisiana's great specialty; it produces three fourths of all the cane grown in the United States, outside of Hawaii, and more than 11 times as much as the next heaviest producer, Georgia. This is an extensive crop, concentrating a great value on a small area; while the value of the crop was over half that of cotton, its acreage was only one fifth as much; with nearly one fourth the total value of farm products, it occupied only 8 per cent of the farm acreage. One of the great drawbacks to Louisiana sugarcane raising, is that about one fifth has to be kept for seed, and cannot be replaced in the same season, while in Cuba the tops of unfit canes are simply dropped into hoe-made holes, and there are plenty always to be had; the Louisiana seed cane often rots, the Cuban never. The Cuban cane is also much richer in sugar, and the yield per acre is about double. From all these causes, the cost of making a pound of sugar is about double in Louisiana what it is in Cuba. Corn, as in all the Southern States,— owing to its value as a food crop, for feeding swine, and in some States for distilling,— has always had far greater attention than any other cereal; in 1900 it was nearly three fourths of the entire cereal crop, valued at $10,327,723, and increased over 60 per cent in the next decade. But the great coming food crop is rice, whose culture increased about two and a half times in the last decade, and nearly all of this in the last three years; owing to the introduction of improved methods by a quantity of Iowa immigrants, and of a new system of irrigation, which has revolutionized rice culture and worked a complete transforma-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A R K A N S A S
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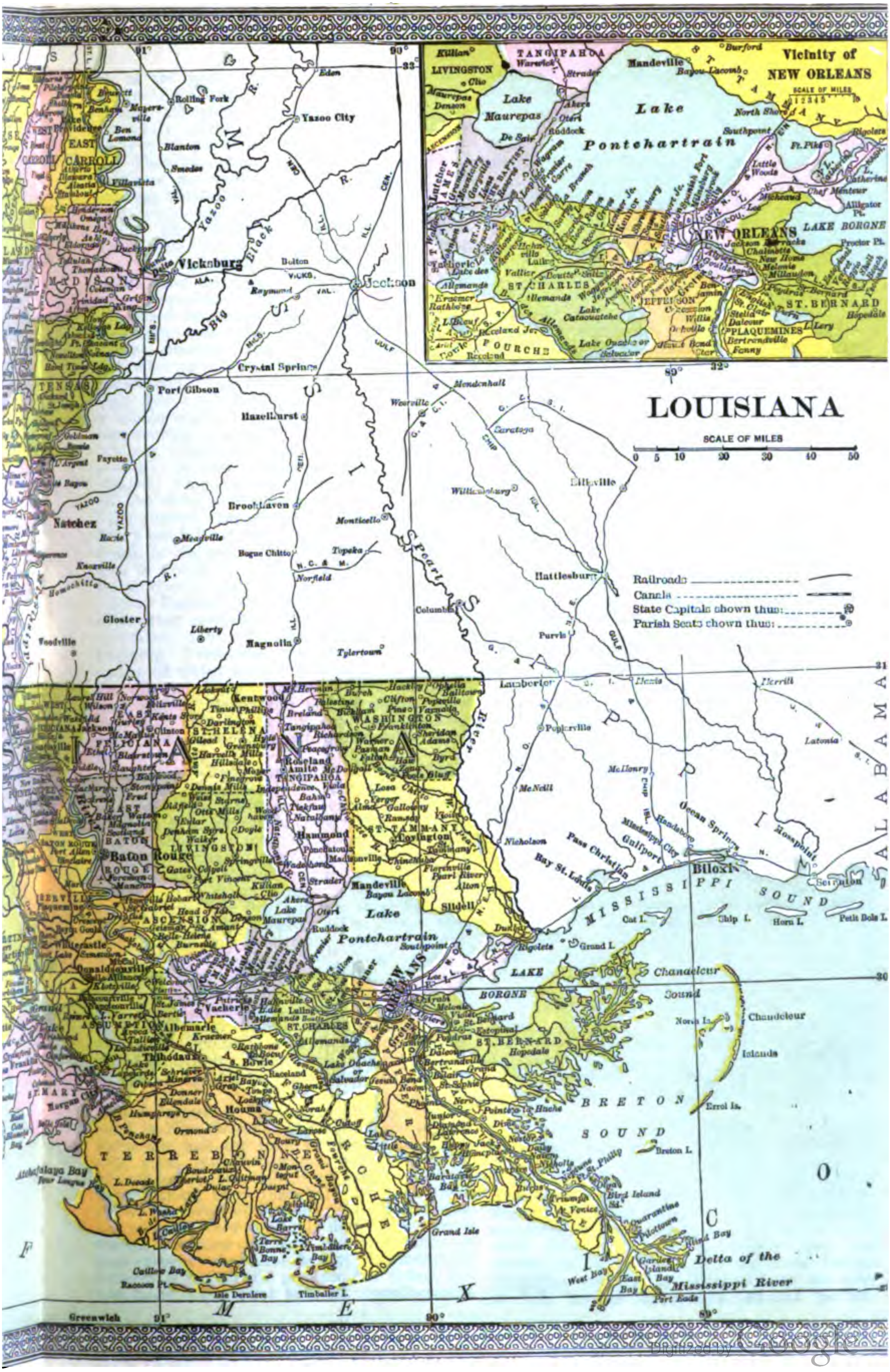
G U L F O F
Caddo Lake
Jefferson
Marshall
Longview
Carthage
Joaquin
Tenaha
Timpson
Center
Nacogdoches
San Augustine
Lufkin
Emporia
Milam
Hemphill
Jasper
Newton
Colmesneil
Woodville
Kirbyville
Campwood
Warren
Buna
Kountze
Silsbee
Lemonville
Orange
Beaumont
Port Arthur
Sabine Pass
High Island
Stowell
Sabine
Neches
Sabine River
Lake Sabine
CADDO
BOSSIER
WEBSTER
CLAIBORNE
UNION
MOREHOUSE
LINCOLN
OUACHITA
RICHLAND
BIENVILLE
JACKSON
CALDWELL
FRANKLIN
DE SOTO
RED RIVER
WINN
SABINE
NATCHITOCHES
GRANT
CATAHOULA
VERNON
RAPIDES
AVOYELLES
CALCASIEU
ST. LANDRY
ACADIA
LAFAYETTE
ST. MARTIN
CAMERON
VERMILION
SHREVEPORT
Homer
Minden
Ruston
Monroe
Natchitoches
Alexandria
Leesville
Pickering
Opelousas
Washington
Crowley
Lafayette
Lake Charles
Westlake
New Iberia
Jeanerette
Franklin
Abbeville
Calcasieu Lake
Grand Lake
White Lake
Vermilion Bay
Marsh Island
Mud Lake
Cameron
Grand Chenier
West Cote Blanche Bay
East Cote Blanche Bay
Atchafalaya
Longitude West from


LOUISIANA
SCALE OF MILES
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Railroads
Canals
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SCALE OF MILES
Lake Maurepas
Lake Pontchartrain
NEW ORLEANS
LAKE BORGNE
TANGIPAHOA
LIVINGSTON
ST. TAMMANY
ST. CHARLES
JEFFERSON
ST. BERNARD
PLAQUEMINES
Mandeville
Chef Menteur
Alligator Pt.
Proctor Pt.
Rigolets
Pt. Pike
Vicksburg
Jackson
Yazoo City
Rolling Fork
Port Gibson
Hazelhurst
Brookhaven
Natchez
Monticello
Columbia
Hattiesburg
Magnolia
Tylertown
Gloster
Liberty
Woodville
Mendenhall
Ellisville
Williamsburg
Purvis
Lumberton
Poplarville
McNeill
Nicholson
Bay St. Louis
Pass Christian
Gulfport
Mississippi City
Biloxi
Ocean Springs
Moss Point
Scranton
Yazoo R.
Big Black R.
Pearl River
MISSISSIPPI SOUND
Cat I.
Ship I.
Horn I.
Petit Bois I.
ALABAMA
EAST CARROLL
MADISON
TENSAS
WEST FELICIANA
EAST FELICIANA
ST. HELENA
WASHINGTON
TANGIPAHOA
LIVINGSTON
EAST BATON ROUGE
Baton Rouge
ASCENSION
ASSUMPTION
ST. JAMES
ST. CHARLES
ST. MARY
TERREBONNE
LAFOURCHE
PLAQUEMINES
ST. BERNARD
Kentwood
Amite
Hammond
Covington
Slidell
Donaldsonville
Thibodaux
Houma
Morgan City
Chandeleur Sound
Chandeleur Islands
BRETON SOUND
Breton I.
Grand Isle
Barataria Bay
Timbalier Bay
Terre Bonne Bay
Atchafalaya Bay
Caillou Bay
Isle Dernière
Timbalier I.
Delta of the Mississippi River
Port Eads
East Bay
West Bay
Grand L.
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tion in the great coast-prairie belt of southwestern Louisiana, and southeastern Texas, formerly almost in primitive solitude. Up to 1897 nearly all the rice grown on these prairies was «Providence» rice, dependent mainly on rainfall. Then two years of drought showed that there was no security without irrigation, and there was a stampede to the «pump lands,» where a new world was created by raising water from bayous. This district, as above said, is full of slightly raised ridges; the canals are run along these, not by digging, but by throwing up parallel dikes for a channel; as the water in all these regions lies below the land to be irrigated, it is raised by pumping plants at the heads of the canals, and distributed to the lands by gravity; sometimes two or more pump stations are needed on the same canal to lift the water high enough. This immense draft on the water supply has created alarm for the future; but the whole region is underlaid with exhaustless water-bearing gravel strata, and easily bored wells can irrigate 100 acres without diminishing the flow. In 1900 over 25,000 acres were thus irrigated. This prairie has the further advantage over the delta district, formerly the chief seat of the culture, that in the latter the heavy machinery needed for improved cultivation was apt to sink in the soil. The celebrated perique tobacco is grown in the Parish of Saint James. The product in 1902 was 33,375 pounds.

Stock Raising.— While this is small relatively to the other agricultural branches, it is of some importance; and in the line of dairy products is increasing. These were valued at over $4,000,000 in 1900, of which something over $1,000,000 was sold off the farm. Swine slightly increased, sheep slightly decreased; but as natural with increasing farm work of any kind, horses, mules and asses increased considerably more than half.

Fisheries.— Louisiana ranks next to Florida among the Gulf States in the value of its fish catch. As a whole, however, the industry seems not to be increasing largely; the last report in 1897 showed a total little larger than 1890, the figures being $713,587, the number of men employed 4,403, chiefly on the boat or inshore fisheries. The oyster fishery is second only to that of Chesapeake Bay, and was three fifths the entire value of the fisheries. The oyster reefs extend almost unbroken to the mouth of Atchafalaya Bayou to the State line. Large canneries have been established on the Gulf. The seine fishery is declining; but Louisiana is still the chief source of shrimps, as well as for catfish caught with the trot-line. The alligator catching industry is decreasing with the gradual exhaustion of the supply; at the same time the scarcity of hides constantly enhances the market value.

Manufactures.— These are chiefly concentrated in New Orleans, which produced in 1909 nearly one half the total for the State, which with 2,516 establishments, was valued at $223,928,000. In the eight chief industries of the State, making more than half the total, there was over a threefold increase from 1890 to 1900, and what is very unusual, there was almost exactly the same increase in the number of wage-earners who total 84,243; the industrial tendency is to increase product, but reduce human labor. The total bulk of manufacturing in the State is working up its raw materials of sugarcane, cotton, forest products, and rice. Foremost, and amounting to close upon two fifths of the State's entire manufactured products, is the refining of sugar. The sugar and molasses produced in the census year were valued at $47,891,091, and the business gave employment to 15.4 per cent of all the State's wage-earners. The greatest obstacle heretofore (aside from difficulties stated under *Agriculture*) has been the necessary idleness of the expensive plants during the greater part of the year; but an industry is now developing which serves a doubly profitable end,— the making of paper from the bagasse or cane refuse,— thus keeping the plants going, and utilizing a waste product heretofore used only for fuel. With a little jute or manila, this has been found to make one of the finest grades of heavy paper. Second in importance was the manufacture of lumber and timber products, aside from planing-mill products, sashes, doors, and blinds, etc., these were valued at $17,408,513, and had more than trebled in the decade. In 1890 the production was almost exclusively of yellow pine lumber, cypress shingles, and white oak staves; in 1900 there had been a great increase of the manufactures from cypress and hardwoods, cypress sawing alone employing many of the largest establishments in the State, and the stave manufacture having practically ceased. The lumber industry is just beginning to attract the attention of capitalists on a large scale,— this and rice being the business «booms» of the present. At no time in the State's history have there been so many large lumber plants under construction. The long-leaf pine manufacture has its centre at Lake Charles, in the southwest. The manufacture of cottonseed-oil and cake holds third place; in 1900 the products were valued at $7,026,452, while in 1890 they were somewhat over one fifth that amount. This is one of the industries fostered indirectly by the Mississippi jetties, which by increasing New Orleans' distribution facilities, have made it worth while to import cotton seed and develop a larger manufacture than the local supply would make possible. The refining of cottonseed-oil is a recent New Orleans industry. The cleaning and hulling of rice produced $5,736,451 of finished product. A great and rapidly developing industry is the manufacture of burlap bags for handling cotton seed, fertilizers, etc.; it grew from $669,945 in 1890, to $3,443,468 in 1900. The foundry and machine-shop products amounted to $2,672,761, their work largely in making and repairing sugar machinery. Planing-mill products and carshop work were considerable. There were in Louisiana in 1902–3 eight cotton mills with 101,752 spindles; the consumption was 18,003 bales of cotton. Many new mills are in construction.

Commerce and Transportation.— Louisiana is the richest State in the Union in total length of navigable streams, 3,771 miles. Its lower part is a vast web of paths to the ocean, aggregating 2,500 miles. The entire 600 miles of the Mississippi's length in the State is navigable and largely navigated, and the jetties have trebled its value, made New Orleans a far greater corn and cotton port than before, and will draw foreign commerce still farther. A canal from the river to Lake Borgne has greatly lessened the distance from the city to the Gulf and to the coal-fields of Alabama, hence reducing the cost of fuel for manufacturing purposes. The railroad facilities have not been very extensive till the last decade, when they increased from 1,739 to 2,801 miles, and are now 3,221. The growing importance of New Orleans has led a number of trunk lines to make a special effort for its business; owing to the nature of the Gulf coast, all turn away many miles from it. The chief lines are the Southern Pacific, the Texas Pacific, the Louisville & Nashville, the Queen & Crescent, and the Illinois Central. Many others are laying plans for entering the city. As with most Western and Southern States now, rates are fixed by railroad commission. New Orleans is the third port in the United States in amount of foreign commerce, next to New York and Boston. For the year ending 30 June 1909, its imports and exports (principally the latter) amounted to over $190,000,000. In 1902-3 it received 2,316,617 bales of cotton, and exported 2,112,281 bales. The vessels entering and clearing for the year were upward of 4,000, with a gross tonnage of nearly 5,000,000.

Banks.—The State has an excellent banking system, very conservative in its holdings of reserves; the New Orleans banks were notable for their exceptional solidity and punctuality in meeting northern obligations when the Civil War broke out. On 30 June 1909 there were 35 national banks in operation, with 11,423 depositors and $2,481,754.82 in savings deposits. There were also 116 state banks with 22,836 depositors and $6,334,169.73 in savings deposits. In the year ending 30 Sept. 1909 the exchanges at the United States clearing house in New Orleans aggregated $840,444,100, an increase over 1908 of $24,506,681.

Government and Finance.—The Constitution of 1898 was devised to exclude the illiterate negro vote, except for owners of property to over $300 who are excepted from educational qualification. Otherwise than that, each voter must be able to fill out his application blank for registration, but this does not apply to anyone who was a voter on 1 Jan. 1867 (that is before the 14th or 15th Amendment was passed), or his son or grandson of mature age. Women taxpayers can vote on all questions of taxpaying in any subdivision of the State. State officers are elected for four years. The Governor has $5,000 salary, the pardoning power, and a veto by items, which may be overridden by a two thirds vote of the elected members of each house. The legislature holds biennial sessions limited to 60 days; both houses are elected for four years; the Senate may be from 36 to 41 in number, the House from 98 to 110, and as a fact the numbers are now 39 and 114; there must be one representative to each parish, and to each ward of New Orleans. The judiciary is headed by a supreme court, consisting of a chief justice and four associates appointed by the governor with the consent of the senate, for 12 years. There are judicial districts, to be not less than 20 nor more than 29; the judges are elected for nine years, as is the district attorney for each. From and after 1 July 1904 there is to be a court of appeals, composed of two district judges designated by the supreme court. There is a militia of 2,693. The State has a large Democratic majority. It sends two Senators and seven members to Congress. The assessed valuation of property in 1910 was $529,419,463; the State tax is five dollars per $1,000. The legislature cannot incur debts except to repel invasion or suppress insurrection. A poll tax on each adult male goes to the school fund (see *Education*). The bonded debt for the fiscal year 1910 was $11,108,300. The total levies of ad valorem taxes for 1902 were $8,478,370.

Education.—Louisiana, formerly near the foot of the ladder in the general education of its people, has made extraordinary efforts in the past two decades, and in some respects has surpassed all other Southern States; a fact more creditable from its large negro population. The average school term (128.5 days) was the longest of any Southern State, the terms of colored schools were as long as those of the white, and the amount expended is exceedingly creditable, being in 1908 $3,572,589, or nearly half as much as the current receipts of the State, and in 1907 nearly $2,169,000. The school revenues are made up of 1¼ mills from the State property tax of six mills on the dollar, a poll tax of $1 on all males over 21,—retained in the parish were levied, and other local taxes may be laid,—special corporation taxes, etc. By the law of 1902, the school administration is centralized in a State board of education consisting of the governor and seven appointees, the superintendent of education, and the attorney-general; this appoints a four-year board of education for each parish (county), who appoint parish superintendents. The enrolment in schools during 1901 was 63 per cent of the white children from 6 to 18, and 40 per cent of the colored; in both cases more than a three-fold increase in 20 years. Despite all efforts, however, the load of illiteracy is a heavy one to struggle against; 61 per cent of the negro and 17 per cent of the white population above 10 could neither read nor write. In 1908 there were 6,966 teachers, nearly three fourths female; over 1,000 colored teachers, about evenly divided. Besides these there were many hundred private teachers. The pupils in the Catholic schools alone were about 25,000. Total pupils enrolled in common schools were 254,861. For higher education there were 57 public and 80 private high and secondary schools, two industrial colleges, the Industrial Institute at Ruston (north Louisiana) and the Southwestern Industrial Institute at Lafayette, two normal schools, the State at Natchitoches, and that of the city at New Orleans; the State University and Agricultural and Mechanical College at Baton Rouge, partly supported by the United States; Tulane University, with affiliated special colleges, one of the best reputed institutions in the South; and a number of Roman Catholic and sectarian colleges. For the colored people are four—Southern University, Leland University, New Orleans University, and Straight University. Total receipts (1909) for universities and colleges, exclusive of private benefactions and public appropriations, $361,381.

Charitable and Penal Institutions.—The State Board of Charities and Corrections can only inspect and report. The old system of leasing out convicts to private contractors was abolished by the constitution of 1898, and they are now only employed on public works or convict farms,

LOUISIANA.

STATE CAPITOL AT BATON ROUGE.

or in manufactures owned and operated by the State; and parish jail inmates may be employed on public works within that parish. The State Insane Asylum is at Jackson, a Lepers' Home in Iberville Parish, institutions for the deaf and blind at Baton Rouge, and there are State hospitals at New Orleans and Shreveport. The health of New Orleans is regulated by the State Board of Health, composed of nine physicians, four appointed by the governor, and five by the New Orleans City Council.

Churches.— The strongest denominations in order of church societies, are the Baptists, Southern Methodists, the two forming the bulk of the Protestants, Roman Catholics, Presbyterians, Protestant Episcopalians, Lutherans, and Unitarians. The Roman Catholics are stronger here from the long Spanish and French domination than anywhere else in the South. In New Orleans are located a Roman Catholic archbishop and bishops of the Protestant and Methodist Episcopal churches. There is also a Roman Catholic bishop at Natchitoches.

History.—The earliest knowledge of Louisiana dates from the discovery of the mouth of the Mississippi in 1528 by Narvaez. De Soto, 13 years later, crossed the great river on rafts at some point about the Arkansas; of the importance of this discovery the Spaniards were wholly ignorant. The next Europeans to sail on the great river were the French. In 1673 Marquette and Joliet were sent by the governor of Canada to seek the river which might lead to the great western ocean. They descended as far as the mouth of the Arkansas. In 1682 they were followed by La Salle, who completed the work of discovery and took possession of the country, which he called Louisiana, in the name of Louis XIV. In 1684 he sailed from France with colonists to form a settlement. He missed the mouth of the river, landed at Matagorda Bay and was murdered in 1687. Brave men were not lacking to take up the enterprise, and in 1698 Iberville, with his brother, Bienville, sailed from Brest for the Mississippi. Finding the Spanish in possession of Pensacola, he stayed for a short time at Mobile, and then entered and explored the lower part of the rivers. His first settlement was at Biloxi, despite the protest of the Spanish governor of Pensacola. In 1702 the site of the colony was removed to Mobile. Antoine Crozat obtained the concession of Louisiana in 1712. It was handed over for 25 years to the Western or Mississippi Company, founded by John Law. Bienville was again made governor and was able to carry out his long-formed plan to create a city where is now New Orleans. Later, in 1722, he was able to make it the capital of the colony. The Western Company sent out large numbers of emigrants, and the colony increased in population, but not in prosperity; misgovernment and Indian wars prevented all progress. In January 1732 Louisiana was surrendered to the king. Iberville resigned in 1743 and was succeeded by Vaudreuil, under whom were isued levee ordinances and police regulations for New Orleans. In the following years there was no improvement in the condition of the colony, of which the annual expense was a drain on the exhausted resources of France. In 1762, by the treaty of Fontainebleau, Louisiana west of the Mississippi, together with the island of Orleans, was ceded to Spain, and in the next year Louisiana east of the Mississippi, together with Florida, was surrendered to Great Britain by the Treaty of Paris. The dissatisfaction of the Louisianans, and the long delay of Spain in taking possession of her new colony, gave rise to a serious revolt which was sternly suppressed by O'Reilly. He, however, provided for a form of government under which the colony made considerable progress. The great growth of the population on the upper Mississippi caused a demand for freedom from all restrictions of commerce on the river. This was obtained temporarily by concessions from the Spanish governors, but when the right of deposit was refused in 1803, there was grave danger of a descent on New Orleans. The desire of Napoleon to create a colonial empire in America led to the secret treaty of St. Ildefonse in 1800, by which France acquired that portion of Louisiana formerly ceded to Spain. In 1803 fear of English invasion induced Napoleon to sell Louisiana to the United States for $15,000,000. (See ANNEXATION; LOUISIANA PURCHASE, for statistics of size and location.) On 28 March 1804 the part south of lat. 33° N. was organized as Orleans Territory; the northern part being organized as Louisiana Territory, afterward changed to Missouri Territory. An enabling act was passed 20 Feb. 1811 to form Orleans into a State, and it was admitted 8 April 1812. The French element was so strong that the constitution allowed members of the legislature to debate either in French or in English, and the dividing line in politics was usually between the two, with temporary alliances of other elements. The organization of the Whig Party, one of whose cardinal tenets was protection, which helped sugar, turned Louisiana into one of the strongest Whig States in the South, she twice voting for Whig Presidents. The slavery issue, after 1860, made it more and more strongly Democratic, and in 1860 it was heavily for secession. New Orleans was captured by the Federal troops 25 April 1862, and the State government, whose seat had been Baton Rouge since 1852, was transferred to Opelousas. During the rest of the War the territory held by the Federals was recognized as the legitimate State government, though under a military governor, and sent members to Congress. On 30 July 1866 an attempt of the colored leaders to hold a constitutional convention at New Orleans and secure the admission of their race to the franchise, resulted in the massacre of many of the delegates by the whites; which had much to do with the excessive severity with which the subsequent Reconstruction government bore on the latter. (For the general history of the time, see RECONSTRUCTION. For the part borne by the State in the imbroglio of 1876, see ELECTORAL COMMISSION.) The most important item in the subsequent history was the passing of the Constitution of 1898, with the "Grandfather Clause," to disfranchise the negroes, which has reduced the negro registration to about 7,000, as against over 120,000 whites. The State governors have been W. C. C. Claiborne 1812, Villere 1816, T. B. Robertson 1820, H. S. Thibodeaux 1824, H. Johnson 1824, P. Derbigny 1828, A. Beauvais 1829, J. Dupre 1830, A. B. Roman 1831, E. D. White 1835, A. B. Roman 1839, A. Mouton 1843, I. Johnson 1846, J. Walker 1850, P. O. Hebert 1853, R. C. Wickliffe 1856, T. O. Moore 1860, H. W. Allen 1864, M. Hahn

1864, J. M. Wells 1865, B. F. Flanders 1867, J. Barker, 1868, H. C. Warmoth 1868, P. B. S. Pinchback 1872, W. P. Kellogg 1873, F. T. Nicholls 1877, L. A. Wiltz 1880, S. D. McEnery 1881, F. T. Nicholls 1888, M. J. Foster 1892, W. W. Heard 1900. The following are the names of the principal authors who have written on Louisiana: *History:* Le Page, DuPratz, Martin, Gayarre, Fortier. *Description:* Darby, Stoddard. *Botany:* Rafinesque, Chapman. *Ornithology:* Audubon. *Literature:* Fortier. *History and Development of New Orleans:* Cable, King, Castellanos.

Population.—The census figures from 1810, when it was first counted separately as the Territory of Orleans, are as follows: (1810) 76,556; (1820) 152,923; (1830) 215,739; (1840) 352,411; (1850) 517,762; (1860) 708,002; (1870) 726,915; (1880) 939,946; (1890) 1,118,587; (1900) 1,381,625. In 1910 it was 1,656,388, an increase of 19.9 per cent. The foreign born were 52,903, of whom 17,431, or about one third, were Italians, 12,604 Germans, 6,500 French, and 6,436 Irish. The colored population was 650,804, or nearly half, a relative decrease since 1890 of over 12 per cent, due to the higher death rate among the negroes. Louisiana was sixth in absolute number of colored inhabitants, and third in relative number, next below Mississippi and South Carolina. There are 59 parishes or counties in the State. The legislature is forbidden to create new ones with less than 625 square miles and 7,000 inhabitants, or divide an old one so as to leave either portion less than these magnitudes. There are no large cities, except New Orleans with 287,104 people, in 1900, and in 1910 over 339,075; the great Mississippi port, and destined to a much larger growth. Shreveport, the next, on the upper Red River, had 28,015; Baton Rouge, the capital, on the Mississippi, 30,500. The only others above 5,000 are New Iberia in the south and Lake Charles in the southwest and Monroe in the northwest, Alexandria on the lower Red River, and Minden east of Shreveport.

Sociology.— Owing to the preponderance of the population and the general importance of New Orleans it has been found useful to locate there institutions usually found at the State capitol. The Supreme Court sits in the Cabildo on Jackson Square, and the State Library is also in the city. The two most important libraries in the State are the Howard Memorial Library for reference, and the New Orleans Public Library for circulation established, which provide for the public of New Orleans the use of nearly 100,000 books. There are published in the State 188 newspapers, of which two, the New Orleans *Picayune* and the New Orleans *Times-Democrat,* are important dailies. The literature of the State consists of two groups of writings: the one in French covering the period between 1835 and 1855, including those of Gayarre and Rouquette, and a brilliant series of works in English prose and poetry by Townsend, King, Davis, Fortier, Ficklen, etc., which have been produced in the last 30 years of the 19th century.

William Beer,
Librarian Howard Memorial Library,
New Orleans.

Louisiana, Mo., city, in Pike County, on the Mississippi River; and on the Chicago & A., and the Chicago, B. & Q. R.R.'s; about 85 miles northwest of St. Louis. It is situated in an agricultural region, and is the trade centre for a large extent of country in both Missouri and Illinois. Its chief industrial plants are flour and lumber mills, button factories, brick yards, lime works, tobacco factories, wagon and carriage factories. Nearby are large quarries and extensive nurseries. The trade is chiefly in its manufactured articles, dairy and nursery products, grain, fruit, and live stock. There is a good public library. Pop. (1910) 4,454.

Louisiana, Code of. In the history of law in the United States the first important experiment with a code in the United States was made in Louisana, which State, originally a French colony, afterward ceded to Spain, again returned to France, and subsequently acquired by the United States from France, has had many changes of law. After the United States acquired Louisiana there arose a strong demand for a code, owing to the great confusion of laws. In 1806–8 a code was adopted, but only to supersede the ancient laws when they conflicted with it. A complete civil code was adopted for the State in 1824, which had for its basis the *Code Napoléon,* although some provisions of the common law were injected into it. The Louisiana code was the foundation for a later code prepared for the State of New York under the guidance and supervision of David Dudley Field. This code, although published, and having formed the foundation for many of the codes adopted by the various States, was never accepted by the legislature of New York. See Code.

Louisiana Creoles. This appellation belongs exclusively to persons of French and Spanish descent born in Louisiana: notwithstanding the prevalent error to the contrary according it to Louisiana-born children of any European blood. Though often misrepresented, the creoles of Louisiana, as a matter of fact, are intelligent, brave and generous, and are, by no means, inferior in the matter of education; they are also in the enjoyment of the highest social privileges. The women of true creole lineage are world-famed for grace and beauty. The creoles have furnished Louisiana some of its ablest governors, its most distinguished military men, its eminent writers, its leading professional men, financiers and merchants. In 1904 they held a number of the most exalted offices in the State, and were likewise fully represented in all branches of high and meritorious effort. Very many of the creoles now in Louisiana are descended from high and noble families in France and Spain, and they treasure the lofty traditions of their ancestry. The expression "creole negro" is often used, and its employment has perhaps contributed to the false impression which some entertained that the Louisiana creole, truly such, must be, or is, of negro blood. The term under immediate consideration simply means that the negro to whom it is applied, or his progenitors, has been reared under a creole master. So far as the true creole families are concerned, they have been jealous of their Caucasian lineage and careful to maintain the purity of their blood. The word "creole" is often used to designate the origin of certain products of the field and farm, such as creole chickens, eggs, butter, etc. The meaning of this is that the products thus named are strictly from creole portions of the State of Louisiana. A certain debased idiom of the French employed among negroes, and, to some extent, among creole children and lower whites, is popularly called «creole.» It has figured in literature in the shape of short stories, proverbs, etc. The better element of creole adults speak and write the French language in its purity. The majority likewise, have a correct and fluent use of the English language. An effective answer to the aspersions, by some sought to be cast upon the character of the olden creoles, is the following citation from the Chevalier Guy Soniat du Fossat, a distinguished officer of the French army who was in New Orleans in 1751. In his 'Synopsis of the History of Louisiana, etc.,' he gives the following:

«Creoles are defined to be 'the children of Europeans born in the colony.' They, in general, measure about 5 feet 6 inches in height; they are all well shaped, and of agreeable figure; they are lively, alert, and agile, and, notwithstanding the great heat of this climate, are laborious. They are born with ambition, and an honest self-esteem. They are endowed with a natural disposition for all sciences, arts, and exercises that amuse society. They excel in dancing, fencing, hunting, and in horsemanship. Nature has favored them with a penetrating and active mind, and they are capable of being easily instructed. The lack of teachers renders their education somewhat incomplete, and it must be said, in all justice, that among the many qualities which they possess are politeness, bravery, and benevolence. They are good fathers, good friends, and good kinsmen.

«The women, besides having the qualities above enumerated, are agreeable in figure and seldom deformed. They make good mothers, and are devoted to their husbands and their children, and in their marital relations seldom are they unfaithful. I must also add that the stranger arriving in this wild and savage country will be surprised to see in this capital, as exists in all countries of Europe, brilliant assemblies where politeness, amiability and gayety reign supreme.»

Bussière Rouen,
Officier d'Académie,
Secrétaire perpetual de l'Athénée Louisianais.

Louisiana, District of. See Orleans, Territory of.

Louisiana Purchase, The, was the purchase by the United States from France of the Province of Louisiana, the treaty of sale being dated 30 April 1803. The price paid for the province was $15,000,000. Its area was 875,000 square miles (almost as great as that of England, Ireland, Scotland, Wales, France, Germany, Spain, the Netherlands, Italy and Switzerland), as compared with 820,944 square miles in the original 13 States. Its limits extend from the Mississippi River on the east (including the New Orleans district east of the Mississippi) to the main divide of the Rocky Mountains and to the Arkansas, the Red and the Sabine rivers on the west; and from the Gulf of Mexico to the Canadian line.

The results of this transaction were to prevent forever the erection of a hostile power on the west bank of the Mississippi and to make inevitable the ultimate annexation of Texas, Oregon, New Mexico, and California, and the expansion of the United States into a nation of continental proportions and of world influence. It was perhaps the most important sale of territory ever made. President Jefferson wanted New Orleans in order to control the mouth of the Mississippi on the east side, and offered to guarantee to Napoleon all the territory west of the Mississippi if this inducement became necessary in order to get that town. Looking for a city, he had an empire thrust upon him. Napoleon's necessities — his war with England, his desire for money to aid in prosecuting the war, his determination that England should not gain the territory, and his wish to raise up a rival to England on sea and land — worked to the eternal advancement of the United States, of representative institutions, and of the world's progress.

The wilderness which Jefferson's enemies ridiculed him for buying comprises to-day, in whole or part, chiefly in whole, 12 States — Louisiana, Arkansas, Missouri, Iowa, Minnesota, North Dakota, South Dakota, Nebraska, Kansas, Colorado, Wyoming and Montana — and Oklahoma and the Indian Territory. This region is nearly a third of the area of the present United States, and it gives homes to almost a fifth of its inhabitants. Its population of 50,000 in 1803 had expanded to 14,708,616 in 1900, or nearly three times the population of the entire United States in 1800, and in 1904 amounted to nearly four times the whole country's population at the time Washington was first inaugurated as President.

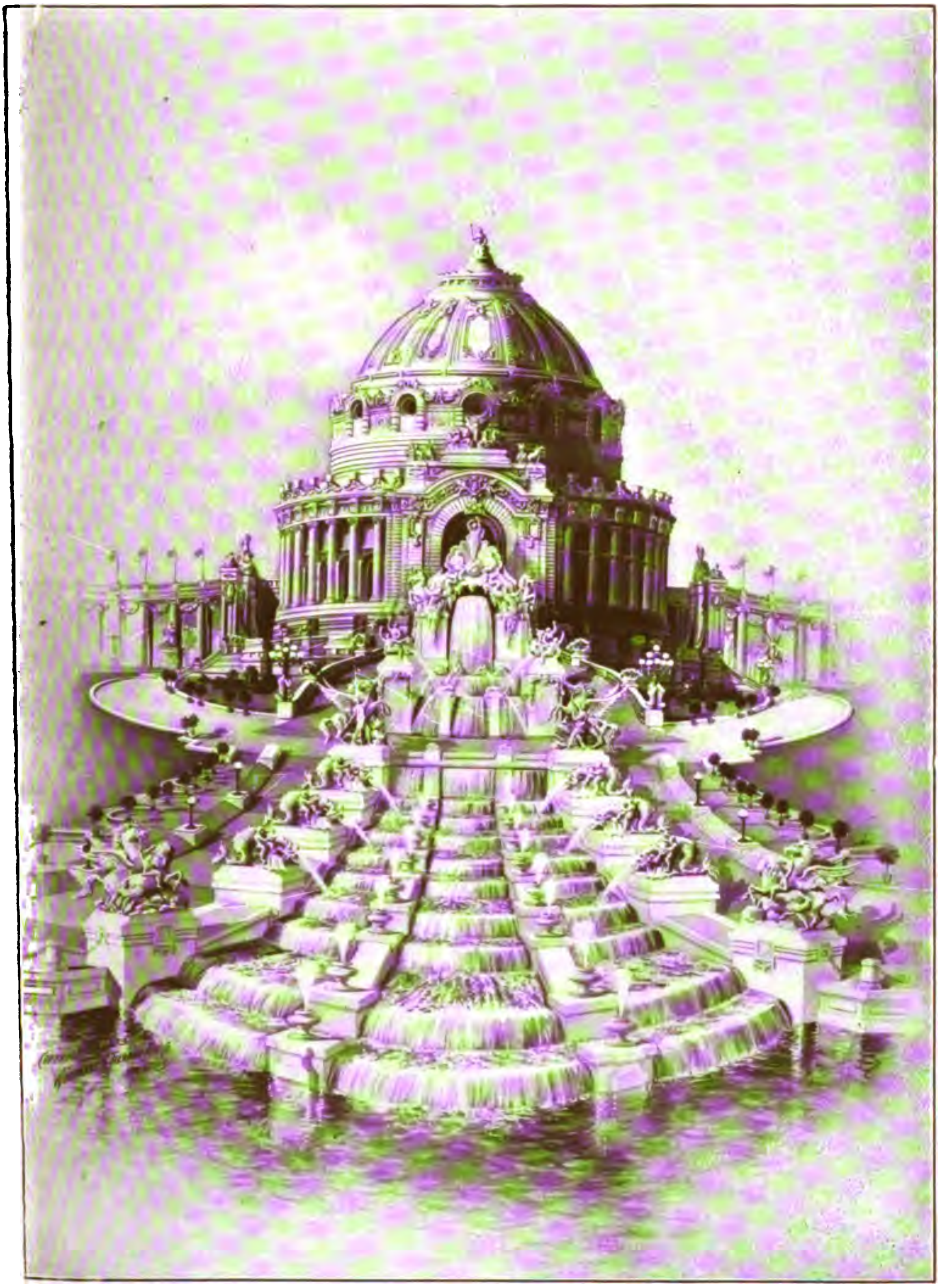
The States and Territories of the Purchase produced 264,000,000 bushels of wheat in 1900, valued at $152,000,000 — more than half of the wheat crop of the whole United States; 1,013,000,000 bushels of corn, or 48 per cent of the country's product; 38 per cent of the country's oats. The wheat, corn, oats, rye, barley, cotton, hay and potatoes produced in this region in 1900 brought $755,000,000, and its farm animals were valued at $825,000,000, 38 per cent of those of the whole country.

Besides transferring the United States' boundaries from the Mississippi ultimately to the Pacific, the Louisiana annexation and its direct results, the acquisition of Texas, of New Mexico, of California and of Oregon, swung the seat of the country's activities across the Alleghanies into the great valley. The geographical centre of the contiguous parts of the United States is in northern Kansas, in the heart of the Louisiana Purchase, and the other pivotal points are traveling rapidly in the same direction. The centre of population, which was a few miles west of Baltimore in 1801, when Jefferson was first inaugurated, was near Columbus, Ind., in 1900; and the centre of manufactures, which was hurrying after it, was close to Mansfield, Ohio, in the same year. At the same time the centre of the corn production was 54 miles southwest of Springfield, Ill., and the centre of the number of farms was 110 miles east by south from St. Louis, in Wayne County, Ill., not far from the Louisiana Purchase border.

Louisiana Purchase Exposition, The, or **Universal Exposition,** held at Saint Louis, Mo., in 1904, opening 30 April; one of the greatest exhibitions the world has ever known; 42 States and 53 foreign governments having exhibits. The various States appropriated $3,000,000 more for this exposition than for the Chicago World's Fair, and the vast exhibit covers more ground than the Chicago, Paris and Buffalo expositions combined. The Government Building is one mile from the Grand Trianon of France, along a stately boulevard, between eight of the finest exhibit palaces ever built. The boulevard is crossed by three courts; the central court is 2,500 feet long and 600 wide. Between the palaces is a mile of lagoons and canals. The amusement street is a mile long. The Philippines cover 40 acres. The Agricultural Palace is 1,600 feet long and covers 20 acres. The dome of the Hall of Festivals is 200 feet high. In it is the largest organ in the world, 62 feet wide, 40 feet high, with 10,000 pipes. The intramural railroad is nine miles long and touches every point of interest in a site two miles long and one mile wide. In fact, the attractions at this exposition are so many and varied and the undertaking so enormous that no detailed description can be given. A volume of over 200 pages is required for the prize lists and regulations of the Live Stock Department alone. This department includes eight groups, and there are 15 of these great Exhibit Departments, including 141 groups and 801 classes. Large bodies of State commissioners in all the States, assisted by local committees in counties were engaged for over a year past in collecting the best specimens that liberal prizes could call forth. All known governments co-operated in this work, each intent upon making the best possible exhibit. The Exposition shows all the products, processes, inventions, discoveries and triumphs of art and industrial skill, and is a vast museum of human progress, human efforts, hopes and aspirations. Besides broadening the scope of each department so as to include a greater number of related groups and classes, this Exposition was the first to organize a distinct Educational Department and rank it in the post of honor at the head of the list. Here, for the first time, the educator is given opportunity to compare intelligently the educational systems, institutions, methods and work of the various European nations with those of the United States, which include the competitive exhibits of the public schools of all the States and cities. In the Social Economy Department is exhibited the most complete and thorough illustration of the new Science of Humanity yet attempted, embracing all the enormous advances in the past ten years along this line by every government and city of Europe and America; showing state regulations of industry and labor, industrial organization of workers, methods of industrial remuneration, co-operative institutions, the housing of the working classes, liquor regulations and general betterment movements. Independent of this department, but related to it as an «outside exhibit» there is a great «Model City» in which the leading cities of Europe and America have displays illustrating their municipal utilities, economies and betterments — displays full of interest and edification for the urban taxpayers and home owners of America. The Physical Culture Department, equipped with a gymnasium and athletic field, race track and an immense amphitheatre, and aided by the counsels and active co-operation of the leading athletic associations of the world, conduct a protracted series of athletic events lasting from 14 May to 24 November, at which a long list of splendid prizes and championships will be competed for in intercollegiate, interscholastic and international contests, embracing all sorts of games, feats and sports. Among these will be the great Olympic games under the direction of the International Olympic Committee; contests of historic and worldwide interest, enlisting the world's most famous athletes and champions. The still exhibits of this department will include everything illustrative of physical culture and its methods; gymnastic trophies and gymnastic equipments for schools and associations. Among other features are the International Press Parliament, the International Congress of Jurists and the World Congress of Arts and Sciences, in the discussions of which the most distinguished professors, publicists and teachers of the world were invited. The deliberations illuminate every branch of art, science, and education, economics, politics, philosophy, technology, sociology, etc., involved in the comprehensive scope of the exhibits. Here will also be assembled the world's first fleet of air-ships and flying machines, in competition for a prize of $100,000.

Each of the 15 departments in the great exhibition outgrew all plans and anticipation; and the result is a much vaster display than was thought possible even in this advanced age. Additional areas were necessarily allotted to the great palaces of Art, of Liberal Arts, of Manufactures, of Varied Industries, of Machinery, of Electricity, of Transportation, of Agriculture, of Horticulture, of Fish, Game and Forestry, and of Mines and Metallurgy. Besides the Exposition Company's cash fund of $15,000,000, there has been spent $1,650,000 by the United States Government on its own separate exhibits; over $6,000,000 by foreign governments; $6,500,000 by the several States on their exhibits, and immense sums by cities, associations, fraternities, corporations and individual exhibitors.

During the last 50 years each of the recognized Universal Expositions has surpassed its immediate predecessor. Each was an epitome of the new ideas, new discoveries, new achievements of a new period in the world's progress, and as the art of organizing and equipping Expositions progressed, and the world's appreciation of their value increased, larger endowments were obtained for them, and choicer and more comprehensive exhibits became available from all parts of the world. Governments, scientific societies and art organizations were everywhere accumulating finer specimens in their museums, and becoming prepared to make better and better contributions to the treasures of a World's Fair exhibit, thus greatly widening the Exposition's choice of articles. By this natural process the Louisiana Purchase Exposition came into possession of better opportunities and advantages, and far ampler resources than any of its predecessors. In every field of improvement, social, industrial, or intellectual, it gathered the priceless products of the prolific seeds its predecessors planted. For the first time in the history of expositions, foreign governments actively helped to collect for the exhibition the finest productions of every clime, and the most excellent achievements of mankind, in arts and crafts and in all lines of social improvement. The ar-



THE HALL OF FESTIVALS.

THE ARTISTIC CENTRE OF THE EXPOSITION.

rangement of exhibit plans and the preparations were under the direction of first honor graduates in Exposition science — men identified with Exposition work at home and abroad for the last 30 years. The knowledge and inspiration diffused abroad from every great exposition have stimulated and guided men to so many new discoveries and the invention of so many new industrial utilities, to say nothing of what has been done for the elevation of public ideals in morals and matters of taste, that the world is now, more than ever before, sensible of its indebtedness to their unique educative influence. Instead of being the last, the Exposition of Saint Louis will merely fix the higher standard and afford the better model for other Universal Expositions that will follow in succeeding decades, so long as the Promethean spirit impels men to emulate the gods as benefactors of mankind. The periodic market «fairs» of earlier centuries were the natural outgrowth of economic conditions under a ruder civilization and a cruder industrial development. Such «fairs» still survive under similar conditions in several countries and some have risen to great importance as promoters of trade. As advancing civilization with its modern appliances and modern industrial organization has superseded the market fair with better traffic facilities, their other social utilities have been preserved in competitive exhibitions, offering prizes for the best productions. The noted effect of these local competitive exhibitions in arousing emulation and directing attention to better models and higher standards of industrial effort led to the National Expositions which the great Napoleon inaugurated in France more than 100 years ago, the evolution of which has given us the constantly progressing series of World's Fairs that have stimulated and guided the geniuses of all nations through the last five decades of the 19th century.

David R. Francis,
Pres. of the Louisiana Purchase Exposition.

Louisiana State University and Agricultural and Mechanical College, a State educational institution at Baton Rouge, La. In 1855 a State school was founded under the name of the State Seminary of Learning, and was opened in 1860 with W. T. Sherman (later General Sherman) as superintendent. In 1861-5 the school was suspended on account of the war. In 1874 an agricultural college was established and temporarily located at New Orleans; in 1877 it was merged with the college at Baton Rouge and the university chartered under its present name. The courses offered are the Latin-scientific, literary, general science, mechanical and civil engineering, agriculture, and commerce; in the agricultural department a special course of 5 years is given on the cultivation and manufacture of sugar. There are three experiment stations connected with the University, one at New Orleans, one at Baton Rouge, and the third at Calhoun. Military drill is also a part of the curriculum. In 1910, the total income, including State and Federal appropriations, amounted to $55,500; the number of students was 620, of professors and instructors, 56; and the library numbered 23,000 volumes.

Louisville, loo'ĭs vil or loo-ĭ-vĭl, Ky., the capital of the County of Jefferson, and the principal city of the State of Kentucky, is situated opposite to the falls of the Ohio River, on the Southern shore of the river, on the Louisville & Nashville, the Southern, the Chesapeake & Ohio, the Baltimore & Ohio Southwestern, the Pennsylvania, and other railroads.

Falls of the Ohio.— The falls of the Ohio River are caused by a ledge of Devonian rocks, rich in corals and other fossils, which were lifted from the bottom of the Silurian Sea, in which they were formed, and left here thousands of feet above their place of formation. In ancient geological times this wall of rock, in the form of an anticlinal axis, dammed up the water 25 feet and formed a lake a mile wide and several miles in length, above the dam, while the water below rushed down the other side of the axis, at the rate of a dozen miles an hour, until it was lost in a seething whirlpool below. When the river was low, it was dangerous to attempt to conduct a boat over these falls but when it was high, on account of the narrowness of the stream below and its width in the lake above, the excess of water filled the narrower stream below to a level with the wider one above and vessels passed over the falls as if they had not been there. In 1830 a canal two miles long was finished around the falls, on the Kentucky side, and on the 5th day of December the steamboat Uncas passed through it. The canal has since been enlarged and improved so as to meet the wants of the largest boats and is always used in going over the falls in low water. When the river is high, boats go over the falls and do not have to use the canal.

Site of Louisville.— The natural beauty of the falls of the Ohio was such that they could hardly fail to attract the attention of the intelligent eye which looked upon them. A dense forest with a very great variety of growth covered the country for miles around and the huge sycamores and cottonwoods, growing down to the water's edge, cast their shadows into the stream, not yet polluted by the waste of cultivated lands, and imaged another forest there. Crystal ponds scattered through the forest and verdant islands in the river added beauty and variety to the landscape. When Capt. Thomas Hutchins, of the British Engineers, saw the falls in 1766 he was so delighted with their natural beauty that he drew a picture of them which appeared in his 'Topographical Description of Virginia,' published at London in 1778. It was a very pretty picture then, is now, and always will be.

Plan of Louisville.— The plan of Louisville as originally laid out by John Corbly, in the spring of 1779, consisted of one range of streets parallel with the river and another range cutting them at right angles. The streets parallel with the river and running east and west bore names such as Water, Main, Market, and Jefferson, while the cross streets were known by numbers, such as One, Two, Three, etc. This plan was adhered to until additions to the original boundary made it necessary or gave an excuse for laying out new streets differently. In some of the additions the streets now run in all directions. Broadway as originally laid out, is 120 feet wide; Main, Market, and Jefferson, each 90 feet, and the other streets with a few unimportant exceptions 60 feet in width. In 1813 the paving of streets began. Previous to this time they were mud holes in winter and dirt-piles in summer. That part of Main Street from Third to Sixth was paved after the McAdam style. There are now in the city 176 miles of streets and as many miles of alleys paved with vitrified brick, asphalt, granite, or boulders, and a few with broken stone after the McAdam fashion.

Original Area of Louisville.— The original tract of land given to Louisville for a site by the Legislature of Virginia contained 1,000 acres. The land cost the State of Virginia nothing because it was confiscated from Dr. John Connolly, an adherent of the British during the War of Independence. The Legislature simply took the land from Connolly and gave it to Louisville. The city has since added many other tracts of land to the original until its external boundary now embraces 20½ square miles or 13,120 acres. In other words, Louisville, in a century and a quarter, has increased her original landed estate thirteen fold.

Dwelling-houses.— The first dwelling-houses built in Louisville were 16 by 20 log cabins with board roof and puncheon floor where there was any floor at all, but in many instances the native earth was the floor. The furniture was as plain as the houses and consisted principally of three-legged stools, a bed set on forks, a puncheon table and a few pewter or wooden spoons and plates. The rifle and scalping-knife were in every cabin and were the most costly and useful articles of the household. 'Squire Boone to gratify his own pride and improve the architecture of the town, secured some boards from a flat-boat which had brought immigrants, and built what he thought was a model house. The boards when used were water-soaked and when the moisture was dispelled by the sun the boards warped and twisted and sprang and turned in every direction. The house looked more like an angry porcupine than anything else and Boone was so disgusted with it that he left the town and built a log fort near where Shelbyville now stands. Capt. James Patton, more practical than Boone, found on his lot a huge sycamore that was hollow at the root and had an inside diameter of 12 feet. He utilized this hollow of the tree by building a log cabin against it and using it as a second room. The example of neither of these builders was followed by others but that of Michael La Cassange was. La Cassange was a Frenchman who secured the lot extending from Fifth to Bullitt Streets on the north side of Main. Here he erected a cottage in the style of Louis XIV., which was the only building pretending to any architecture that had been erected up to that time. The cottage was very showy and was the admiration of everybody and was especially liked for the large lot around it with its original forest trees, its shrubbery, its flowers, and its blue-grass, which La Cassange was careful to keep in the best order. The example of La Cassange was followed by others who soon began to build their dwelling-houses on large lots. The fashion has been kept up to our own times and it is rare to see a dwelling-house of any pretensions in Louisville without vacant ground around it, adorned with blue-grass and flowers and shrubbery and trees. On a summer's day one can, in some parts of the city walk for squares beneath the shade trees without the rays of the sun ever reaching him. Louisville is to-day distinguished for no one thing more than for the handsome and comfortable dwelling-houses of her citizens.

Business-houses.— The few rude dwellings were promptly followed by business houses equally rude if indeed the cabin used for a dwelling was not at the same time used for a shop or manufactory. Michael Humble so soon as the town was laid out erected a cabin near the fort at Main and Twelfth streets in which he made and mended guns and wrought out of metal the few things that were used. Joseph Cyrus had next to him a shop in which he made spinning-wheels and looms and everything that was carved out of wood. George Vensonier followed next with a tailor's shop and Henry Duncan with a hat-shop. A little further up town between Fifth and Sixth Streets, Daniel Brodhead had a store in which every kind of article used in the community was sold over the same board counter. These were humble beginnings at manufacturing but they continued to increase until now, according to the 1909 census we have in Louisville 903 manufacturing establishments which invest every year in raw material $54,128,000 and turn out manufactured articles valued at $101,284,000. Our pioneers who were used to log-cabins for all purposes could not conceive of the necessity of the modern establishments if they were to behold them now in use, built of stone or brick, some covering whole squares and others ribbed with steel ascending into the clouds. The public buildings of the city have proportionately increased in dimension and style until they have become real ornaments. The court-house with its severe classic features, the city hall in its Gothic outlines, the custom-house in its blended styles of architecture, the sky-scrapers at the corner of Fourth and Main, and Main and Market, some of the great tobacco warehouses on Main street, and many of the manufacturing establishments and stores in different parts of the city are fine specimens of architecture adapted to the wants of business. The Galt House on the corner of Main and First is one of the finest hotels in the country and a new hostelry is being erected on Fourth Street which will ascend high into the air, and meet every want of the guest. A new jail is going up on the site of one of the early churches which will not only rob the prison of some of its horrors but will be an ornament to the city. The great department stores of Lewis, and Kaufman-Straus, and the New York Store, by furnishing the purchasers with every want have revived the fashion of pioneer times when every article which was for sale was sold under the same roof and made shopping a delight rather than a burden. The building of the American National Bank on the corner of Third and Main and that of the Louisville Trust Company at Fifth and Market are palatial business houses well suited to the purposes for which they were erected as well as ornaments to the city. It is possible that in the near future a business establishment will be erected on the southwest corner of Fourth and Jefferson that will equal if it does not surpass any yet built in the city.

Education.— Louisville as an educational centre is surpassed by but few cities. The University of Louisville with its law and medical departments, the Female High School, the Male High School, the Manual Training School and the Normal School, which are colleges of a high order, the 70 ward schools where children are trained free of cost for the higher departments; the 9 medical colleges, the 2 theological seminaries, the 10 musical societies, the 25 Catholic institutions and the 9 educational associations in some of which the sciences are taught, all together offer advantages to students in almost every branch of knowledge. The Male High School, the Female High School, the Normal School and the Manual Training School, like the ward schools, are free institutions entirely supported by the city.

Charitable Institutions.— Hospitals, asylums and homes are almost as numerous in Louisville as schools. The Children's Free Hospital, where afflicted little ones are cared for, the Kentucky Institute for the Blind, where the sightless are taught to read and write, and 51 other institutions maintained for different purposes are prepared to meet almost every form of infirmity.

Churches.— There are 240 churches in Louisville, in which quite a variety of religions are cherished. The principal denominations are the Baptists, the Methodists, the Presbyterians, the Christians, the Episcopalians, the Catholics, and the Lutherans, but there are also Unitarians, Evangelists, Jews, and those who call themselves Non-Sectarians, Scientists, Seventh Day Adventists, Social Settlements, Spiritualists, Swedenborgians, United Brethren, and Theosophists. Some of the houses of worship like the Cathedral of the Assumption, the Warren Memorial, the Third Avenue Baptist and the Fourth Street Christian, are fine specimens of ecclesiastical architecture and capable of seating large congregations.

Banks.— There are 14 banks and banking institutions in Louisville with a combined capital of more than $7,000,000 and a surplus of half as much more. If the four trust companies and the two title companies which necessarily do a good deal of banking business are added to the banks the capital and surplus of all combined will exceed $12,000,000. The clearing of the banks for the year 1909 were $633,898,400. The largest day's clearing in 1903 (Jan. 2d) amounted to $2,867,000 and the whole month of January showed the sum of $50,706,431. Although the banking capital of the city cannot be said to be large the manner in which it is managed makes money almost always abundant. It is seldom that there is a stringency in the money market here which continues long or really amounts to inconvenience.

Finances.— The finances of Louisville will compare favorably with those of any other municipality in our country. According to the last published report of the assessor the assets of the city amounted to $17,442,552 and the liabilities to $8,836,129. If the liabilities therefore are deducted from the assets, a balance of $8,616,422 will remain in favor of the city. Any bonds issued by the city, are therefore what is known as gilt-edge, for if the city should fail to pay the interest or the principal its property can be sold for the payment. The city, moreover, besides owning this large amount of property in its own name has an income from taxes sufficient to meet all of its fixed liabilities and current obligations. The property within the city limits owned by individuals was assessed in 1910 at $165,000,000. The charter only allows 95 per cent of this amount to be considered in providing for current expenditures so that $6,600,000 must be deducted from this amount. We must also deduct 2¼ per cent allowed for prompt payment of taxes. At the rate of $1.86 tax, the sum of $2,279,960 is raised from the balance, to be expended by the city during the year. This amount is distributed through the different departments of the city so as to provide for every liability and at the end of the year balances are generally left in different departments which are again distributed.

Largest Industries.— Six of the largest industries are whiskey, tobacco, cement, wagons, plows, and leather. More Bourbon whiskey is made in the Fifth District of Kentucky and handled in Louisville than in any other locality. The same may be said of leaf tobacco, and especially Burley leaf. Louisville is the largest market in the world for both of them. The quantity of hydraulic cement, and plows and wagons and leather made here is also enormous. The Board of Trade gives the following figures for 15 leading articles:

Agricultural Implements — pounds	40,000,000
Boots and shoes — cases	114,000
Dry Goods and Notions — cases	678,000
Flour — barrels	710,000
Furniture — pounds	30,000,000
Hardware — cases	985,000
Fine Leather — pounds	11,500,000
Saddlery — packages	255,000
Stoves and Stove castings — pounds	29,500,000
Soap — pounds	27,000,000
Manufactured Tobacco — pounds	52,000,000
White Lead and Paints — pounds	17,500,000
Wagons — pounds	35,900,000
Whiskey — barrels	365,000
Woolen Goods — pounds	15,000,000

Water.— The city owns the works which supply the citizens with water. They are valued at $7,000,000, and a filter is now being added to the plant which, if successful in separating the mud and slime from the water, will make the works cost much more and be proportionately more valuable. The water is sold to citizens at a price much lower than they could obtain it in any other way.

Light.— The citizens have choice of three kinds of light furnished by different companies: these are electricity, artificial and natural gas. If they don't like either of them they can go back to the candles and lamps of their ancestors and do as they did before gas or electric light was invented. Natural gas is also much used for heat on account of its cleanliness and convenience.

Street Railways.— Street railways on which cars run by electricity ramify every part of the city and extend into the suburbs and to distant neighboring towns. No one need walk more than a square in any important part of the city unless he or she prefers to do so. The fare is only 5 cents for the longest distance in the city.

Steamboats.— Steamboats with headquarters at Louisville, in spite of the interference of railroads, are yet seen upon the Ohio and other Western waters, and afford the cheapest rates of freight. There are not, however, so many floating palaces upon the Western rivers as there were before railroads came into use, but there are yet a few which prevent the Ohio and its glories of old from being forgotten.

Board of Trade and Commercial Club.— There is a Board of Trade which keeps an eye on the interests of Louisville, and a Commercial Club which helps in the work. Any enterprise which looks to the interests of the city can be brought before either or both of these associations, and secure recognition and help if deemed worthy. Both of them have done valuable work in behalf of the city.

Newspapers.— There are five daily newspapers, three issued mornings and two evenings. Many weekly, semi-weekly, monthly, and periodical sheets are also issued. The *Courier-Journal* and *Herald* appear mornings and the *Times* and *Post* evenings.

Libraries.— The only public library in the city is the Louisville Public Library, successor to the Polytechnic Library, which was in turn successor to the Public Library of Kentucky. It is located on the upper floor of the fine building erected by it on Fourth Street and rented to Kaufman & Straus. It has some 50,000 or more volumes on its shelves, and is probably arranging at this time to consolidate with a new library which is to be established with money donated by Andrew Carnegie. Ample grounds have been secured on Third and Fourth streets where a suitable building is to be erected to house the books of the two institutions. The Southern Baptist Theological Seminary has a valuable library at the corner of Sixth and Broadway, and there are several other smaller collections which have something of a public character. There are also several large libraries in the city which belong to private citizens, and one of these, which has upon its shelves some 50,000 volumes, is probably the largest private collection in the country.

Sewers.— The sewerage system of Louisville is extensive, but it is undergoing a needed enlargement. The early engineers were disposed to do all the draining of the city toward «Paddy's Run,» a probable survivor of the Ohio when its channel was farther to the south. This system, however, had to be abandoned when it was found that Paddy's Run would itself have to be drained as the city enlarged. The present sewerage system has more than 100 miles and terminates in the Ohio River, where it should have gone at first.

Fires.— The fire department of the city, under a chief, several assistants, and 247 firemen, has 17 steam-engines, three chemical engines, and all the necessary accompaniments of water-towers, hooks and ladders, etc. It is kept up at an annual expense to the city of about $300,000, or at about $1,215 for each one employed.

Police.— The police force of the city consists of 329 men, at an annual cost of about $300,000, or about $1,000 for each one employed. They are arranged after somewhat of a military grading, and consist of one chief with the rank of colonel, 1 assistant with the rank of major, 6 captains, 10 lieutenants, 10 sergeants, 16 corporals, 1 chief of detectives, 11 detectives, 1 special detective, 10 district detectives, 16 mounted men, 13 station-keepers, 10 wagoners, 213 patrolmen, and 1 secretary. The military character of the organization possibly comes from the ascertained fact that policemen have a good deal of fighting to do if they perform their duty.

Amusements.— Theatres are plentiful enough in Louisville to afford every citizen an opportunity of enjoying an evening's amusement. There are six of them, known by the following names: Avenue, Buckingham, Hopkins, McCauley's, Music Hall, and New Masonic.

Clubs.— There are more than 50 clubs in Louisville, either partaking of a literary, scientific, social, political, or some other character. Of these, the best known as a social organization is the Pendennis Club. The Filson Club, besides being social in its organization, is an historic and literary association which, since its beginning in 1884, has published a book every year made up of the original researches of its members into different branches of knowledge. It has now published 19 volumes, and its 20th volume is ready for the printer.

Parks.— The parks of Louisville have only been established in recent years. The present system was organized in 1891, and lands purchased for an eastern, a southern, and a western park. There was no use for a northern park, as the river was on that side. The western, known as Shawnee Park, consists of comparatively level land and embraces 170 acres; the eastern, named Cherokee Park, has 341 acres of gently rolling land cut into picturesque ravines by Beargrass Creek; and the southern, called Iroquois Park, contains 718 acres of land, partly level but mostly hilly, with some of its eminences nearly 300 feet into the air. The park commissioners have recently purchased of the Dupont estate 18 acres known as Central Park, which, added to Baxter and Boone squares, will enlarge the intramural part of the system and meet the wants of those who cannot enjoy the suburban parks. The parks were named after the three Indian tribes who once asserted ownership over the land.

Health.— No city in our country enjoys better health than Louisville. The last report of the Health Office shows the death rate to be only 16 to the 1,000, and this has been the average for many years. Louisville was once an unhealthy city, when the dense forest was first cleared away and the rays of the sun admitted to the many ponds laden with decaying vegetable matter, but all these feeders of disease have long since been removed, and Louisville has become an exceptionally healthy city.

History.— In 1773 Dr. John Connolly located 2,000 acres of land, to which he was entitled for military service in the French and Indian war, on the south side of the Ohio River, immediately opposite the Falls. This land was surveyed for him by Capt. Thomas Bullitt, and on 10 Dec. 1773 Lord Dunmore executed a deed to him for it. Connolly then conveyed to Col. John Campbell one half of this land, and the two undertook to establish a town thereon, which Bullitt had laid out in the original survey. In 1774 they advertised lots for sale, but Indian disturbances arose and no one came to buy the lots. To the Indian troubles difficulties between Great Britain and her colonies succeeded, and increased until actual war was on between them. Connolly, as an adherent of England, was arrested by the patriots and thrown into prison, and Campbell fell into the hands of hostile Indians on his way from the Falls to Fort Pitt. Under such adverse conditions, with both proprietors in prison, the projected town at the Falls came to an end, and was probably forgotten by all except the unfortunate projectors.

In the spring of 1778, while Gen. George Rogers Clark was floating down the Ohio with his boats loaded with soldiers for the conquest of the Illinois country, he felt the necessity of some safe place in which he could discipline his raw recruits. When he reached an island in the midst of the Falls, afterward known as Corn Island, and saw the rapid waters dashing around it, he concluded that was the place he wanted, and that no deserter could make his escape from this island. Hence he landed on this island, on 27 May 1778, and immediately went to work to erect cabins for some 20 families of emigrants who came on his boats, and a block-house for his soldiers and supplies. He was opposed to these families coming on his boats, but was glad they had come, as he could leave the supplies he could not take with him in their care on the island and thus take with him every soldier. At the end of a month he thought his raw troops had been disciplined enough to make them reliable soldiers, and moved off with them down the river to Fort Massac, leaving the emigrants on the island, while the sun was in a full eclipse. The families thus left on the island became the founders of Louisville. So far as has been ascertained, they were about 50 in number, consisting of men, women, and children, and one negro. They remained on the island until the news came that Gen. Clark had conquered Kaskaskia, Vincennes, etc., and put an end to the Indian raids, that came from the British posts there to prey upon the helpless families of the Virginia border. Then, by order of Gen. Clark, they built a fort on the main shore and moved into it in time to celebrate their first Christmas in the wilderness with a dinner and a dance.

The interest attached to the subject among the descendants of these founders of Louisville, who are numerous, will justify the record of their names here for the preservation of their memories. So far as has been ascertained they were the following:

James Patton, his wife Mary, and their three daughters, Martha, Peggy and Mary.

Richard Chenowith, his wife Margaret, and their four children, Mildred, James, Jane and Thomas.

John McManess, his wife Mary, and their three children, John, George, and James.

John Tewell, his wife Mary, and their three children, Ann, Minnie, and Jessie.

William Faith, his wife Elizabeth, and their son John.

Jacob Reager, his wife Elizabeth, and their three children, Sarah, Mariah and Henry.

Edward Worthington, his wife Mary, his son Charles, and his two sisters, Mary (Mrs. James Graham) and Elizabeth (Mrs. Jacob Reager).

James Graham, his wife Mary.

John Doune, his wife Martha, their son John, and their colored man, Cato Watts.

Isaac Kimbley, and his wife Mary.

Joseph Hunter and his children Joseph, David, James, Martha (Mrs. John Doune) and Ann.

Neal Dougherty, Samuel Perkins, John Sinclair, and Robert Tevis.

There may have been others whose names have not been preserved, and some of those named may not have been among the number. The list, however, is probably the best that can be made at this late day.

The above named persons who came to the Falls with Gen. Clark, and those who joined them as immigrants in the following spring, held a public meeting 10 April 1779, and appointed William Harrod, Richard Chenowith, Edward Bulger, James Patton, Henry French, Marsham Brashears, and Samuel Moore trustees to lay out a town. These trustees met on the 17th of April 1779, and, having agreed upon a plan of the town, named it Louisville and employed John Corbly, a surveyor, to lay it out and make a map of it. The plan of the town, as mapped out by Corbly, consisted of nothing but one street running along the bank of the river and 12 cross-streets cutting it at right angles. The numbering of the lots on Corbly's map can be likened to nothing but a puzzle of the most exasperating and unsolvable kind. The numbering is not consecutive and could not have been a reliable guide to the owners or anyone else.

On the first day of May, 1870, the legislature of Virginia, in response to a petition of those who had laid out the town, confirmed their act and appropriated 1,000 acres of the land which had been forfeited from Connolly, for the benefit of the town. The same act of the legislature appointed nine trustees to manage the affairs of the town. These trustees were John Todd, Stephen Trigg, George Slaughter, John Floyd, William Pope, George Merriwether, Andrew Hines, James Sullivan, and Marsham Brashears.

The city continued under the government of trustees, either appointed by the legislature of Virginia or Kentucky or elected by the people, from 1780 to 1828. It might be interesting to point out the acts of the trustees as city-builders during the period of 48 years, but space is not permitted here for such details. Room can only be allowed to sum up in a few words the result of their many acts.

Under their administration the city grew from a few log cabins, straggling along Main Street, which was nothing but a blazed dirt road through the forest, to comfortable and tasteful houses of brick and stone along paved streets. They hewed down the dense forests where the wild animal and the wilder savage dwelt, and drained the ponds which bred disease and death. They increased the population from only about 100 to 10,000, and the value of property in the city from nothing, to which they were reduced by their contest with Col. Campbell, to $2,500,000. They were an easy-going board of old Virginians, who liked things to go well of their own will, but avoided no labor or danger when their duty required them to act. They had some queer rules for the government of their meetings, such as confiscating to their own use any liquor that a member might presume to bring a second time to a meeting, and passed some funny resolutions, such as the one which offered a premium for the scalps of rats; but no breath of scandal was ever whispered against them or their acts. They generally come into office poor and went out poorer. They held office at too early a day to make money out of it as modern officials do. They passed but few, if any, resolutions which yet stand for law, and left no public buildings that are yet among us to call them back to memory. They did one good thing, in laying off Main and Market and Jefferson streets 90 feet wide, but they did another which over-balanced this good act when they abandoned the public grounds Gen. Clark had mapped out and prevented the city from having parks at the beginning of its career.

By the charter of 1828 Louisville passed from the government of trustees to that of a mayor and 10 councilmen. The first election under the charter occurred 4 May 1828, when John C. Bucklin was elected mayor. At the same election John M. Talbott, W. D. Payne, G. W. Merriwether, Richard Hall, James Harrison, J. McGillycuddy, John Warren, Elisha Applegate, Daniel McCallister, and Fred Turner were elected councilmen.

The elements of progress were in this charter, and Louisville soon began a prosperity such as she had never enjoyed before. One of the wisest provisions of this charter was in the following words:

> The Mayor and councilmen shall have power and authority to establish one or more free schools in each ward in the city, and may receive donations of real and personal estate to erect necessary buildings and to provide the necessary revenue for their maintenance and may supply the funds from time to time by a tax on the ward where such school or schools shall be established.

This provision in the charter of 1828 is the foundation on which rests the free school system of the city and State. It was the first official act of any city on the subject, and we owe to it the many ward schools and the Female High School, the Male High School, and all the other free schools in the city.

The city has greatly prospered since the adoption of this charter, although the charter itself was not of long duration. It was superseded by the charter of 1851, which added to the governing power a board of 12 instead of 10 aldermen, and increased the number of councilmen to 24. It also established the school board, the waterworks, the board of health, the board of police, the board of fire, and the sinking fund. If it had done nothing but establish the sinking fund, by which specified parts of the revenue of the city, sufficient to pay the interest on the city's debts and to pay the principal when due, it would have done well. A third charter superseded the second in 1870, but the charter which added most to the departments of the city government was that of 1892. Under this charter a score of new departments or bureaus of the city were established. All of them report to the mayor and council, but it takes them all to conduct the affairs of the city. Some of them are necessary, but others might, in the opinion of wise men, be merged in those that are absolutely necessary and thus save considerable outlay for supernumerary office-holders.

Quite an effort is now being made to enlarge the sewerage of the city and to establish a new public library commensurate with the wants and the growth of the city. Two hundred and fifty thousand dollars have been contributed by Mr. Carnegie for a library building on a lot owned by the city. Such a sum, without any addition, should supply a building equal to all wants for many years to come. Louisville is certainly on the highway to metropolitan dimensions, and there is seemingly nothing in the way to arrest her progress. She now occupies an area of more than 20 square miles, with a population of 230,000 within her walls and 50,000 more in her suburbs. With a noble river connecting her with all the waterways of the Mississippi Valley, and railroads making her a part of the system of the whole country, her progress is assured to the goal of municipal greatness.

Population.— The first inhabitants of Louisville were some 20 families, numbering probably 50 persons and consisting of white men women, children and one negro, who came on the boats of General Clark as emigrants to Kentucky and landed on an island in the Ohio, in the midst of the Falls, 27 May 1778. They erected log cabins on the island, afterward known as Corn Island, and remained there until the fall of 1778, when, by the order of General Clark, who had conquered the Illinois country, they erected a fort on the mainland and moved into it. In the spring of 1779, joined by other immigrants, they laid out a town on the mainland and named it Louisville, in honor of Louis XVI., king of France, who was then helping the colonists in their rebellion against Great Britain. By the first of May 1780 these immigrants had increased possibly to 100, and were at work building log cabins so as to free themselves from the confinement of the fort. By 1790 they had probably increased to 350, and in 1800, when the United States census for the first time recorded the population, but did not give it accurately, they had increased to 600. The United States census in after decades gives the population as follows: (1810) 1,357; (1820) 4,012; (1830) 10,341; (1840) 21,210; (1850) 43,194; (1860) 68,033; (1870) 100,753; (1880) 123,758; (1890) 161,129; (1900) 204,731. The population on 1 Jan. 1904 was estimated at 228,550, but the last census, that of 1910, placed it at 223,928. Including the suburbs and Jeffersonville and New Albany, which are only separated from Louisville by the river, the population now exceeds 275,000.

Consult: McMurtrie's 'Sketches' (1819); Casseday's 'Louisville' (1852); Johnston's 'Memorial History of Louisville' (1896).

R. T. Durrett,
President of the Filson Club.

Louisville & Nashville Railroad. The Louisville & Nashville Railroad Company's main lines extend from Cincinnati, Ohio, to Atlanta, Ga., via Lexington, Knoxville, and Chattanooga; from Cincinnati to Memphis, Tenn., via Louisville and Guthrie; from St. Louis, Mo., to Pensacola, Fla., and to New Orleans, La., via Nashville, Birmingham, Montgomery and Mobile; and to intermediate cities.

The road was chartered on 5 March 1850, and the main line was opened to the public in November 1859. The company prospered, and from time to time other branches of the road were built and other systems absorbed, until at the close of the fiscal year ending 30 June 1910 the company operated 4,398.37 miles of railroad, in Illinois, Indiana, Kentucky, Tennessee, Alabama, Florida, Mississippi, and Louisiana. It also owns a majority of the capital stock or is joint owner or lessee of 2,407 miles more railroad lines, comprised in the following roads: Nashville, Chattanooga & St. Louis Railway, the Birmingham Southern Railroad, the Georgia Railroad and its dependencies, the Atlanta, Knoxville & Northern Railway, and the Chicago, Indianapolis & Louisville Railway. If to this mileage be added that of 41 miles of roads operated by the Louisville & Nashville Railroad, but whose earnings are not included in the earnings of the last named railroad, and 247 miles of lines owned but not operated by the Louisville & Nashville Railroad, the grand total of mileage for that railroad system amounts to 6,356 miles.

Some of the notable extensions of its systems made by the Louisville & Nashville Railroad in recent years include its acquisition of the lines of the Atlanta, Knoxville & Northern Railway (whose lines extend from Marietta, Ga., to Knoxville, Tenn., and from Blue Ridge, Ga., to Murphy, N. C.), which, being connected by an extension built from Knoxville to Saxton, Ky., gave the Louisville & Nashville Railroad a direct line from Cincinnati to Atlanta; the joint purchase of the 'Monon Route' by this road and the Southern Railway Company on 20 May 1902 — being accomplished by acquisition of 51 per cent of the capital stock of the Chicago, Indianapolis & Louisville Railway Company (for joint account, the purchasing roads making payment in joint 4 per cent bonds at the price of 90 per cent of par value for the preferred and 78 per cent of par value for the common shares); and the joint acquisition by the Louisville & Nashville Railroad Company and the Atlantic Coast Line Railroad Company of the Georgia Railroad and its dependencies, these roads having taken over the historic lease of William M. Wadley, bearing date of 7 May 1881.

But the Louisville & Nashville system itself passed under the control of the Atlantic Coast Line Railroad Company on 1 Nov. 1902, the latter corporation purchasing slightly more than half the capital stock for $30,600,000.

The capital stock of the Louisville & Nashville Railroad Company is $60,000,000, of which $59,916,200 is outstanding. But under its charter the company may increase its capital stock to an amount that shall be equivalent to the full cost of the railroad and its branches. This cost, including the property itself, the real estate and lands, and the improvements and betterments, but exclusive of all amounts outstanding to the credit of the company, supplies, revenue from rentals, etc., on 1 July 1904 amounted to $138,807,865.36. On the same date the funded debt represented a total of $113,342,500.

The rolling stock of the Louisville & Nashville road on 30 June 1904 consisted of 679 locomotives; 353 passenger cars; 146 baggage cars, express cars and mail cars; 30,905 freight cars of various kinds; and 779 cars used in the service of the road.

For the year ending 30 June, 1904, the road showed gross earnings of $36,943,792.73 and total expenses of $25,141,548.27, making the net earnings $11,802,244.46 and the total net income (including income from other sources) $18,437,398.64. From this income were paid taxes, interest on funded debt, sinking funds, dividends, etc., to the amount of $9,749,227.16, leaving a balance surplus for the year of $3,688,171,18. The dividends included in the above payment amounted to $3,265,931.30. This amount, placed to the credit of the profit and loss account, brings the balance to the credit of that account to the figure of $11,684,424.34. The dividend rate was increased in February 1905 to three per cent, semi-annually.

During the year ending 30 June 1904 the company operated an average total of 3,618 miles of railroad, allowing a total of 6,535,900 passenger train miles, 13,903,656 freight train miles, and 879,037 mixed train miles. A total of 8,647,469 passengers were carried a total of 314,681,892 miles; 21,429,278 tons of freight were moved 3,460,354,603 miles. The gross earnings of the road per mile were $10,210.57; the operating expenses per mile were $6,948.65, leaving the net earnings per mile of railroad at $3,261.92 — the ratio of expenses to earnings being 68.05 per cent.

The Louisville & Nashville Railroad Company owns but does not operate the Yellow River Railroad of Florida, a short line of less than 30 miles, operated independently. It also leases or operates the following roads, whose earnings are not included in the income account of the lessee company: The Eastern Railroad, of Alabama, about 20 miles of lines; the Elkton & Guthrie Railroad, of Kentucky, about 11 miles of lines; and the Glasgow Railroad, of Kentucky, about 10 miles of lines.

Lounsbury, lownz'ber-ĭ, **Thomas Raynesford,** American scholar: b. Ovid, N. Y., 1 Jan. 1838. He was graduated at Yale in 1859; in 1862 he enlisted as a volunteer in the Union army and served as 1st lieutenant of the 126th New York Volunteers. He was mustered out at the close of the war, and, after private tutoring for three years, became in 1871 professor of English in the Sheffield Scientific School of Yale University. He retired from active service in June 1906. He has edited Chaucer's 'House of Fame' and 'Parlement of Foules,' and is the author of 'History of the English Language' (1879); 'James Fenimore Cooper' in 'American Men of Letters' series (1883); 'Studies in Chaucer, his Life and Writings' (1892); 'Shakespeare as a Dramatic Artist' (1901); 'Shakespeare and Voltaire' (1902).

Lourdes, loord, France, town, in the department of Hautes-Pyrénées; on the Gave de Pau; about 85 miles southeast of Bayonne. It is situated where seven mountain passes lead to favorite resorts in the Pyrenees. Nearby are valuable marble and slate quarries. Formerly Lourdes was famed for its chocolate and its fortified castle, which was considered impregnable in the days before the invention of firearms. Lourdes was then called the "key of the Pyrenees." In the 18th century the castle was converted into a prison and became the Bastile of the Mountains. In the year 1858 Lourdes acquired new fame. A little peasant girl, about 14 years of age, named Marie-Bernarde Soubirous (better known as "Bernadette") reported to her parents, on 11 Feb. 1858, that she had seen a most beautiful lady in a grotto at the rocks of Massabielle, a part of the town. The pastor of the Roman Catholic church at Lourdes, and the priests of the neighboring towns, also the bishop of Tarbes, the diocese in which Lourdes is located, all gave the matter no attention until people from a distance began to visit Lourdes, and miracles were reported, and scientists had begun observations and investigations. On 25 Feb. 1858 a spring appeared in a place where no water had been seen before. It was some days before the child gave a name to the lady; it was then Virgin Mary, under the name L'Immaculatée Conception. The matter was then investigated by the ecclesiastical authorities and pronounced a genuine apparition, and many cures were said to be miraculous. The place has become noted for the large number of visitors, fully 300,000 annually. A magnificent church has been erected at the grotto, the flags of all nations show that pilgrims from the countries of the whole world have visited the place. Again and again have scientists investigated and reported for and against the miraculous appearance of the spring and its efficacy as a cure for diseases. There has never been imputed any wrong motive to "Bernadette" or her parents.

Consult: Lassere, 'History of Lourdes'; Boissaire, 'Lourdes, Histoire medicale' (1891); 'Les Annales de Notre Dame de Lourdes'; Saint John, 'The Blessed Virgin in the 19th Century' (1902).

Louse, the name of small parasitic insects of a family (*Pediculidæ*) of doubtful affinities, but usually considered to be *Hemiptera*, much degraded through long-continued parasitism. The lice are all of small size, have soft, much flattened bodies with thin integument, the abdomen enlarged, the thorax indistinctly segmented, and without the slightest trace of wings, and the short legs terminated with strongly hooked, stout claws. The mouth-parts are adapted for sucking, but the homology of the several organs with those of the *Hemiptera* is still doubtful. There is a short proboscis provided with hooks, from the centre of which, when fixed in the skin of the host, there protrudes an extremely delicate tube. The head is also provided with a pair of short, three or five-jointed antennæ and small simple eyes. Probably on account of their disgusting habits the lice have been but little studied, and beyond the fact of their parasitism very little is known of their habits. They feed exclusively upon blood, which is secured by wounding the host's skin, fixing the proboscis by means of its hooks, and inserting the delicate tube above mentioned in the wound. A suction-bulb in the head propels the blood through the long writhing œsophagus into the bilobed stomach. Lice never leave their host except to pass to another, and the eggs, as well as all stages of the young, are found with the adult. Only six genera and less than fifty species have been described, but it is probable that a very great many others remain undiscovered. They are found on mammals exclusively, each species of mammal commonly harboring a peculiar species of louse. Man is more richly endowed, having three species: the head-louse (*Pediculus capitis*), the body-louse (*P. corporis*), and the crab-louse (q.v.). The two first mentioned are very closely alike and are said to vary according to the different races of men which they infest. Human lice are of course associated with filth, and are found only upon neglected children and persons of uncleanly habits. A very remarkable louse is found on the seal, and is consequently aquatic. The bird-lice (q.v.) or *Mallophaga* are entirely distinct from the true lice.

Consult: Schiödte, Annals Nat. Hist., 1866; Piaget, 'Les Pediculines'; Giebel and Nitzsch, 'Insecta Epizoica'; and various recent papers on Mallophaga by Kellogg in the 'Proceedings U. S. National Museum.'

Louse'wort, any of various weeds of the genus *Pedicularis*, of the broom-rape (q.v.) family, which contains low, usually pubescent, perennial herbs, with chiefly pinnatifid leaves, and a spike of purplish, two-lipped flowers. The species are few, and the most common is *P. canadensis*, sometimes called wood-betony.

Louvain, loo-văṅ (Flemish, *Leuven*; German, *Löwen*), Belgium, city in the province of Brabant; on the Dyle, 15 miles east by north of Brussels. It was surrounded by earthen ramparts, which have been converted into pleasant promenades, which form almost a perfect circle, diameter nearly two miles. There are many buildings of historical interest, among which are the Hôtel de Ville, one of the richest and most beautiful Gothic buildings in the world, elaborately and exquisitely decorated in every part of its exterior by sculptures of subjects taken, for the most part, from the Old Testament (restored 1842, injured by lightning 1890); the collegiate church of St. Peter, almost opposite the Hôtel de Ville, built at the end of the 14th century, an edifice of vast extent, and rich in works of art, particularly a fine 'Holy Family' by Matsys. The educational institutions are numerous, among them are the university, which has a number of American students who are studying for the priesthood, a college, an academy of fine arts, two normal schools for the training of teachers, several secondary and elementary schools. There are hospitals, homes for orphans, and other charitable institutions. It has a number of manufactories, the most important of which are the tanneries. For a general trade the town is well situated, having ample communication both by railroad and the Louvain canal. The name of Louvain first appears in history about the end of the 9th century. It was surrounded with walls in 1115, but was afterward much enlarged. The dukes of Brabant inhabited the castle till the 13th century. At the beginning of the 14th century Louvain was the capital of Brabant, contained 200,000 inhabitants, and had an extensive and flourishing trade in the manufacture of broadcloth and all kinds of woolens. The populace, jealous of the privileges of the nobles, revolted in 1382, and being overcome by Duke Wenceslaus and subjected to severe oppression, emigrated in great numbers to England, and thus caused the decay of the town. Pop. about 46,000.

L'Ouverture, Toussaint. See Toussaint L'Ouverture.

Louvois, François Michel Le Tellier, frāṅ-swä mē-shĕl lė tĕl-ē-ā loo-vwä, Marquis of, minister of war to Louis XIV.: b. Paris January 1639; d. 16 July 1691. He was early made a royal councillor through the influence of his father. After 1666 he had the whole management of the ministry of war, and soon exercised a despotic control over his master the king, and over the army. His extensive knowledge, his decision, activity, industry, and talents, rendered him an able minister; but he was too lavish of the blood and treasure of France. Justly appreciated, Louvois must be considered as the evil genius of the showy but disastrous reign of Louis XIV. The war of 1672 against Holland was begun at his instigation. The victories of Turenne in 1674 and 1675 were gained by a disobedience of the orders of the minister of war; but the desolation of the Palatinate was commanded by him. On the death of Colbert (1683), of whom he had been the enemy, his influence became still greater, and one of its most fatal effects was the revocation of the Edict of Nantes (1685), the *dragonnades*, and the consequent flight of so many peaceful and industrious Calvinists. The encroachments of France had united the European powers in the League of Augsburg. Louvois would have the king commence operations against the allies at once, but the growing influence of Mme. De Maintenon was sufficient to prevent this. In 1688, however, the French forces took Philipsburg on the Rhine, and on the order of Louvois, the Palatinate was reduced to a wilderness in midwinter (1689). Louvois' organization of the army lasted till the Empire; but he also undid the work of Colbert, and destroyed the commerce of France.

Louvre, loovr, **The**, an old royal palace at Paris, on the north bank of the Seine, a splendid quadrangular edifice, with a court in the centre, completed by Napoleon. The origin of its name, and the time of the erection of the oldest part of it, are unknown. It is only known that Philip Augustus, in 1214, built a fort and a state prison in this place; that Charles V., during the years 1364–80, added some embellishments to the building, and brought his library and his treasury thither. Francis I. erected that part of the palace which is now called the old Louvre. Henry IV. laid the foundation of the splendid gallery which connects the Louvre on the south side with the Tuileries; Louis XIII. erected the centre; and Louis XIV., according to the plan of the physician Perrault, the elegant façade toward the east, together with the colonnade of the Louvre, which is still the most perfect work of architecture in France. At a later period Louis XIV. chose the palace built by him at Versailles for his residence. After Napoleon had taken possession of the Tuileries he began a second gallery, opposite to the former, by which the two palaces would have been made to form a great whole, with a large quadrangular court in the centre; only 600 feet of it were completed at the time of his abdication, and it remained uncompleted till 1857, when the work, in an improved and extended form, was finished. It was greatly injured by the communists in May 1871, the Richelieu pavilion, containing the magnificent library, being burned. The Louvre was set apart by the Convention as a museum for the national collections in science and art. It contains the museums of paintings, drawings, engravings, bronze antiques, sculptures, ancient and modern, together with special collections of antiquities, and an ethnographical collection.

Lov'age, an umbelliferous plant of the genus *Levisticum*, native to the south of Europe, sometimes cultivated in gardens, and notwithstanding its strong and peculiar odor, used as a salad plant. Its roots and seeds are aromatic, acrid, and stimulant, and a liquor called "lovage" is made from them. The Scottish lovage is a native of the sea-coasts and has become naturalized in maritime New England. It is eaten, both raw and boiled, by the Shetlanders. The flavor is aromatic, but acrid and very nauseous to those unaccustomed to it.

Lovat, lŏ'vạt, **Simon Fraser**, 12th Lord, Scottish chieftain: b. 1667; d. London 9 April 1747. He was educated at King's College, Aberdeen, and in 1699, on the death of his father, assumed the title of Lord Lovat, to which on the death of the 10th Lord Lovat his father had acquired a disputed claim. In consequence of proceedings taken in 1698 against him and his clan, in which he was declared guilty of treason, he went to France. He afterward obtained a pardon, and returned to Scotland. Being summoned before the High Court of Justiciary, 17 Feb. 1701, for an outrage done to the Dowager Lady Lovat, whom he married by violence, he failed to appear, and was outlawed. In 1715 he was asked by the Jacobites of his clan to espouse the cause of the Pretender, but inducing them to support the government he received in reward the estate and title of Lovat, the other claimant of which had been involved in the rebellion. In 1740 he was the first to sign the association for the support of the Pretender, and on the breaking-out of the rebellion, in 1745, sent his eldest son with a body of his clan to join the Pretender, while he remaining at home asserted his loyalty to the house of Brunswick. He was, nevertheless, found guilty of treason, and was executed on Tower Hill, in the eightieth year of his age. Consult Burton, 'Life of Simon, Lord Lovat' (1847).

Love, Alfred Henry, American woolen merchant and philanthropist: b. Philadelphia, Pa., 7 Sept. 1830. Since 1853 he has been in the woolen commission business in his native city. Since 1867 he has edited 'The Voice of Peace and the Peacemaker,' and 'Court of Arbitration,' a monthly, and in 1866 aided in organizing the Universal Peace Union. He contributed to periodicals many articles on reformatory subjects and made many addresses.

Love-apple. See Tomato.

Love-bird, one of the very small parrots of the genus *Agapornis*, not larger than sparrows, which show extreme affection for one another, two or more sitting as close as possible to one another, and cooing and caressing in a manner most delightful to watch. They are common as cage-birds all over the world, are pretty in color and fond of being petted. They are to be treated and fed in the cage in the same way as canaries. The true love-birds are African, but dealers give the same name to various other diminutive tropical species of similar habits. See Parrots and the books cited there.

Love, Court of. See Court of Love.

Love Feasts, religious meetings held quarterly by the Wesleyan and other sects. Love feasts are retained in avowed imitation of the ancient Agapæ. See Agape.

Love Lies a-Bleeding. See Amaranthus.

Love'dale, South Africa, an important educational and mission station about 40 miles west of King William's Town and 650 miles northeast of Cape Town. It was founded in 1841 and generously supported by the Free Church of Scotland. Besides a general education, it trains teachers for native schools, and gives technical instruction in printing, bookbinding, telegraphy, carpentering, and other useful arts and crafts; its success has been most creditable.

Love'joy, Elijah Parish, American abolitionist: b. Albion, Maine, 9 Nov. 1802; d. Alton, Ill., 7 Nov. 1837. He was graduated at Waterville College in 1826, and at the Princeton Theological Seminary in 1833, and was ordained to the ministry, but soon after assumed the editorship of the St. Louis *Observer*, a Presbyterian paper of considerable influence. His utterances on the slavery question did not begin to appear in the *Observer* until he had been for some time in charge of its columns, and his first references to that subject were marked by moderation. But, stirred by the lynching of a negro murderer by burning, he published an editorial which incensed the pro-slavery part of the community. Hostility was so violent that he removed the paper to Alton, Ill., where a mob threw his press into the river. He was presented with another by Alton friends, and 8 Sept. 1836 published the first issue of the Alton *Observer*. He soon took a bolder anti-slavery stand, and began to call for the organization of a State abolition society. Again, in August 1837, he was mobbed, his office wrecked, and the press destroyed, and when a new press was bought, the ruin was again repeated. The fourth press was set up in a warehouse under an armed guard; but during the night of 7 Nov. 1837 a score or two of men attacked the building, disregarded Lovejoy's warning, were fired upon, and one of the assailants was killed. An attempt was then made to set the warehouse on fire, and when Lovejoy was preparing to shoot the incendiary, he himself received a mortal gunshot wound. The mob then took possession of the place, and once more Lovejoy's press was destroyed. The whole country was excited by these events; public feeling was manifested in various ways; but the most significant effect of the tragedy was a more distinct arraying of forces for the "irrepressible conflict" which had already begun. Consult: J. C. and Owen Lovejoy's 'Memoir' (1838); May, 'Some Recollections of Our Anti-slavery Conflict' (1869); Tanner (one of the defenders of the warehouse), 'The Martyrdom of Lovejoy' (1881); Garrison, 'William Lloyd Garrison' (1885); and Martyn, 'Wendell Phillips — the Agitator' (1890).

Lovejoy, Owen, American abolitionist: b. Albion, Maine, 1811; d. 1864. He was a brother of E. P. Lovejoy (q.v.); was educated at Bowdoin College; and in early life he removed to Alton, Ill. Entering the ministry of the Congregational Church, he preached and lectured against slavery with a power that roused his hearers and carried wide conviction. At Princeton, Ill., where he began a pastorate in 1838, he became conspicuous for the earnestness of his anti-slavery addresses, and for his persistence in holding anti-slavery meetings in defiance of legal and official prohibitions. In 1844 he was elected to the legislature, and resigned his pulpit. Elected to Congress in 1856, he participated in its most exciting debates until the time of his death. He was with his brother Elijah at Alton, Ill., 7 Nov. 1837, and was a witness of his tragic death.

Love'lace, Francis, American colonial governor: b. Hurley, Berkshire, England, about 1618; d. England about 1675. He was a younger son of the 1st Baron Lovelace and in 1668 succeeded Richard Nicolls as governor of New York. He oppressed the inhabitants by heavy taxation and became very unpopular. During his temporary absence from the town the Dutch fleet appeared in the harbor and the citizens speedily surrendered.

Lovelace, Richard, English lyrical poet: b. Woolwich, Kent, 1618; d. London 1658. He was educated at Oxford, entered the army and became a captain. He spent his fortune in support of the royal cause, and after entering into the French service, in 1648, returned to England, and was imprisoned until the king's death. His destitute condition at this time is in marked contrast to accounts of his handsome person and splendid appearance earlier in life. He died in great poverty. His poems, which are light and elegant, were published in 1659 under the title of 'Lucasta.' The best known of his lyrics are 'To Althea, from Prison,' and 'To Lucasta, on Going to the Wars.' Lovelace, who for spirit and gallantry has been compared to Sir Philip Sidney, also wrote 'The Scholar,' a comedy; and 'The Soldier,' a tragedy.

Lov'ell, James, American patriot: b. Boston, Mass., 31 Oct. 1737; d. Windham, Maine, 14 July 1814. He was a son of John Lovell (q.v.), was graduated from Harvard in 1756 and taught in the Boston Latin School under his father in 1757–75. In 1771 he delivered the first anniversary oration on the so-called 'Boston Massacre.' He was imprisoned by General Gage and carried to Halifax, but was exchanged in November, 1776, and sat in the Continental Congress 1776–82. He was collector of the port of Boston, 1788–9, and its naval officer, 1790–1814.

Lovell, John, American educator: b. Boston, Mass., 16 June 1710; d. Halifax, N. S., 1778. He was graduated from Harvard in 1728. The next year he was appointed usher in the Boston Latin School and was its master from 1734 till the siege of Boston caused its suspension, 19 April 1775. He was a rigid disciplinarian, but nevertheless genial and popular. A loyalist in his sympathies he went to Halifax on the evacuation of Boston by the English troops.

Love'man, Robert, American poet: b. Cleveland, Ohio, 11 April 1864. He was graduated from the University of Alabama. He has been a frequent contributor to magazines, and his verse is marked by simplicity and earnestness. He has published 'Poems' in 1889, 1893, and 1897; and 'A Book of Verse' (1900).

Lov'er, Samuel, Irish painter, novelist and poet: b. Dublin 1797; d. Saint Helier's, Island of Jersey, 6 July 1868. He first devoted his attention to painting, and in 1828 became a member of the Royal Hibernian Academy of Art. He afterward wrote novels, which he illustrated himself, dramas, operettas, and songs which he set to music of his own. In 1844 he gave a series of public entertainments called Irish evenings, which he repeated in the United States and Canada in 1846. Among his works are: 'Legends and Stories of Ireland' (1832–4); 'Rory O'More' (1837); 'Songs and Ballads' (1839); 'Handy Andy' (1842); 'Treasure Trove' (1844). The 'Angels' Whisper'; 'Molly Bawn'; and the 'Low-backed Car' are among his most popular songs. His works in 6 vols. with introduction by O'Donohue, were issued in New York in 1900, and with introduction by Roche, in Boston, 1902.

Lov'ering, Joseph, American scientist: b. Boston 1813; d. Cambridge, Mass., 1892. He was a graduate from Harvard, where he became Hollis professor of natural philosophy and mathematics in 1838, and continued to hold the position till 1888, when he was made professor emeritus. From 1884 to 1888 he was director of the Jefferson Physical Laboratory and he was also connected with the Harvard Observatory.

Lovering, William C., American politician: b. Rhode Island 1837; d. 4 Feb. 1910. He was educated at the Cambridge High School. He was president of the Whittenton Manufacturing Company, Taunton, Mass., sat in the State Senate 1874-5 and was a member of Congress as a Republican continuously from 1897.

Love's Labour 's Lost, a comedy of Shakespeare's, supposedly his first dramatic production, written about 1588-9. While marked by immaturity, it has a sprightliness of wit and constancy of good nature which render it both interesting and pleasing. Its sources are not known but, so far as can be told, the plot is Shakespeare's. In 1597 the play was revised and presented at a court entertainment as being «corrected and augmented» by Shakespeare, showing the existence of an earlier version. On this occasion the name of Shakespeare for the first time appeared on the title-page of a play. The cuckoo song («Spring») and the «Tu-whit, tu-who» song of the owl («Winter») give the comedy a fine ending.

Low, lō, **A. Maurice,** American journalist: b. London, England, 1860. He was educated at King's College, London, and in Austria, and since 1886 has been in charge of the Washington department of the Boston *Globe*. He is also the principal American correspondent of the London *Chronicle*. He has published ‘The Supreme Surrender’ (1901).

Low, Charles Rathbone, English historian and naval officer: b. Dublin, Ireland, 30 Oct. 1837. He went to sea in 1853 and has served in Asiatic and African waters. He is a fellow of the Royal Geographical Society and a lieutenant in the Indian navy, and has published ‘Tales of Old Ocean’ (1860); ‘Land of the Sun’ (1870); ‘History of the British Navy’ (1872); ‘History of the Indian Navy’ (1877); ‘History of Maritime Discovery’ (1899); ‘Her Majesty's Navy’ (1902); ‘Britannia's Bulwarks’ (1895); ‘The Epic of Olympas’ (1897); etc.

Low, Sampson, English publisher: b. London 1797; d. 1886. He became manager in 1837 of a trade journal styled ‘The Publisher's Circular,’ on which his ‘British Catalogue’ was afterward based. He established the publishing house of Sampson Low & Co., in 1848. His various compilations include: ‘Index to Current Literature’ (1859-60); ‘Low's Literary Almanac’ (1873); etc.

Low, Seth, American educator and administrator: b. Brooklyn, N. Y., 18 Jan. 1850. He was educated at the Brooklyn Polytechnic Institute and at Columbia, graduating from the latter in 1870. He then entered his father's tea and silk importing business as a clerk, and passing through all the intermediate grades, became a junior partner in the firm in 1875. In 1879 he and the other junior partners took full control of the business which was finally liquidated in 1888. He was early interested in public affairs, especially in charities, was prominent in the movement which resulted in abolishing the system of outdoor relief of Kings County, and was organizer and first president of the Bureau of Charities. He was also active in the Republican party, being president of the Young Republican Club in the Garfield campaign of 1880; and though he resigned the presidency remained an active member of this club, which soon began agitation for the non-partisan administration of city affairs. In 1881 he was nominated for mayor of Brooklyn on an independent ticket, and elected; after an efficient administration he was re-elected in 1883, serving another two years. His administrations were marked by reforms in the system of taxation, and in the public schools, but more especially by the introduction of the civil service system and non-partisan appointments in city affairs. In October 1889 he was offered the presidency of Columbia College (now Columbia University), which he accepted. While he was president, the undergraduate department was enlarged, the graduate schools and Barnard closely affiliated, the institution organized as a university, and the site changed. He also gave the university $1,000,000 for the erection of a library building. He retained his interest in public affairs, was a member of the Rapid Transit Commission, and of the Greater New York Charter Commission, and an earnest advocate of consolidation; he was also twice a referee in labor troubles. In 1897 he was an independent candidate for Mayor of Greater New York and was defeated, though polling over 150,000 votes. In 1899 he was a member of the United States delegation to The Hague Peace Conference. In 1901 he was nominated for Mayor of Greater New York on a Fusion ticket, and was elected. His administration of the next two years led to a reduction of the taxes, sweeping reforms in the police department, and an enlargement of the public school system, and showed a strict adherence to the principles of business-like administration of public affairs which characterized his Brooklyn mayoralty. In 1903 he was again Fusion candidate for Mayor, but was defeated, a defeat generally attributed not to any serious mistakes or faults in his administration, but rather to party questions and complications.

Low, Will Hicock, American painter: b. Albany, N. Y., 31 May 1853. He learned painting at Paris under Gérôme and Carolus-Duran (1873-7), and since 1890 has been Academician of the National Academy of Design, and is one of the founders of the Society of American Artists. He is classed among the most active and versatile of living American artists and has been alike successful in decorative wall paintings, stained glass (at which he worked with John La Farge, q.v.), portrait and book illustration in black and white. His strength as a designer and colorist has been recognized by the public awards made to his work and by the demand for his services on the part of private and public patrons and connoisseurs. He has also had charge of life classes in the schools of Cooper Union, and the National Academy of Design. The following are some of his best known pictures: ‘Portrait of Albani’ (1877); ‘Chloe’ (1882); ‘My Lady’ (Lotus Club, New York); ‘Aurora’ (1894); ‘Homage to Venus’ (mural painting, Waldorf-Astoria, New York)

Low Church, a popular name given to a section of the Church of England whose opinions are opposed to those of the High Church party, and are especially hostile to ritualism and sacerdotalism.

Low Sunday, the first Sunday after Easter, so called to emphasize the contrast between the great feast of the Resurrection and the Sunday which ends the octave. In the Missal (q.v.) and the Breviary (q.v.) the name is «Dominica in Albis,» because on this day the newly baptized wore their white robes for the last time. Mention is made of this custom in the Breviary hymn used in the vespers of Low Sunday, «Ad regias Agni dapes.» The name «Beloken Paschen,» close of Easter, is used frequently in Holland; and «Quasimodo,» the first word in the introit of the Mass for the day, is the common name for this day in Germany and France.

Lowe, Charles, English journalist and biographer: b. Balconnel, Forfarshire, Scotland. He was educated at the University of Edinburgh and on the Continent and was for 13 years *Times* correspondent at Berlin, returning to England in 1891. He has published two biographies of Bismarck: ‘Bismarck's Table Talk’; ‘Alexander III. of Russia’; ‘King Edward VII.’; ‘Our Greatest Soldiers’; etc.

Lowe, Sir Hudson, British general: b. Galway 28 July 1769; d. London 10 Jan. 1844. He entered the army at an early age; in 1813 was attached to the army of Blücher, and took part in the invasion of France in the early part of the following year. Appointed in 1815 to the command of the English troops which were to co-operate with the Austro-Sardinian army in Italy; on the fall of Napoleon he was appointed governor of St. Helena, and entrusted with the care of the ex-emperor. He returned to England in July 1821. He has been accused by the partisans of Napoleon for want of courtesy and for rigor and cruelty to his prisoner. It is, however, freely admitted that Napoleon and his suite made a system of exaggerating their grievances, and even sedulously tried to provoke them, with a view to exciting sympathy in Europe. Many of the grievances were puerile, as that Sir Hudson would not give Napoleon the title of emperor, which England had never recognized, and which he was forbidden by his government to use. Consult: Forsyth, ‘Captivity of Napoleon at Saint Helena from Letters and Journals of Sir Hudson Lowe’ (1853); Seaton, ‘Sir Hudson Lowe and Napoleon’ (1898); Lord Rosebery, ‘Napoleon, the Last Phase’ (1900).

Lowe, John, American rear-admiral: b. Liverpool, England, 11 Dec. 1838. He was eduated in his native city and Columbus, Ohio, and entered the American navy in 1861. He served through the Civil War and accompanied the Greely Relief Expedition in 1884. He was the first naval officer of any nation to serve in a submarine torpedo-boat. This he did in 1898. He was promoted rear-admiral 11 Dec. 1900, and retired the same day. Since his retirement he has participated in an experiment with a submarine torpedo-boat, remaining submerged for 15 hours.

Lowe, Martha Ann Perry, American verse writer: b. Keene, N. H., 1829; d. Somerville, Mass., 1902. She published: ‘The Olive and the Pine’ (1859); ‘Love in Spain, and Other Poems’ (1867); ‘The Story of Chief Joseph’ (1881); ‘Bessie Gray’; etc.

Lowe, Robert, Viscount Sherbrooke, English politician: b. Bingham, Nottinghamshire, 4 Dec. 1811; d. London 27 July 1892. He was educated at Winchester College and at University College, Oxford, and directly upon his admission to the bar in 1842 went to Australia, where he quickly attained prominence in political affairs. In 1843 he became a member of the Legislative Council of New South Wales, and made himself famous by his opposition to the land monopoly, as well as by the part he performed in the development of education and the regulation of finance. He also made effectual protest against the English practice of transporting convicts to Australia. Meanwhile he was not neglectful of his private affairs, but acquired great wealth, and returned to England in 1850. Two years later he was elected to Parliament for Kidderminster, and accepted the position of joint secretary of the board of control, and in 1859, under Palmerston, was placed practically at the head of educational affairs. In consequence of a mistaken vote of censure by the House of Commons in 1864 he resigned his office, but only to participate with ability more marked than before in the proceedings of that body. The rejection of the Whig Reform Bill in 1866 was considered to have been largely due to his powerful speeches against it. As one of the Adullamites (q.v.) he received overtures from the government of Lord Derby, but although he called himself an outcast from the Liberal party he refused to leave it. In 1867 he made a number of speeches designed to justify his opposition to extension of the suffrage. His strong support of the resolutions for disestablishment of the Irish Church, in 1868, restored him to favor in the Liberal party, and in December of that year he became chancellor of the exchequer under Gladstone, giving up that office in 1873 to accept the post of home secretary, in which, however, his tenure was brief. His reforms as chancellor of the exchequer related especially to reduction of sugar duties, the replacing of assessed taxes by license duties, and like readjustments. After the fall of the Gladstone ministry in 1874 Lowe took comparatively little part in public affairs. He was raised to the peerage as Viscount Sherbrooke in 1880. Consult: Parkes, ‘Fifty Years of Australian History’ (1892); Martin, ‘Life of Lord Sherbrooke’ (1893); Hogan, ‘Robert Lowe, Viscount Sherbrooke’ (1893); also Hansard, ‘Parliamentary Debates.’

Lowe, Thaddeus S. C., American inventor and scientist: b. Jefferson, N. H., 20 Aug. 1832. He constructed balloons in 1856 and 1858–9 in order to study atmospheric phenomena, and during the Civil War was chief of the aeronautic corps. He devised a system of signaling in 1862, and valuable instruments for atmospheric investigation, etc., constructed and operated the largest aerostat ever built, invented a compression ice machine and made the first artificial ice in the United States (1865); and established the Lowe Observatory in the Sierra Madre Mountains, Cal.

Lowell, lō'ĕl, **Abbott Lawrence,** American educator and author: b. Boston 13 Dec. 1856. He was graduated from Harvard in 1877, from the law school of the university in 1880, was a legal practitioner in Boston in 1880–97, and from 1897 to 1899 was a lecturer at Harvard. In 1900 he was appointed there to the chair of the science of government, and in 1909 he became president of Harvard University. Among his works are: ‘Essays on Government’ (1889); ‘Governments and Parties in Continental Europe’ (1896), a most valuable explanation of the governmental machinery of European states; and ‘Colonial Civil Service’ (1900).

Lowell, Charles, American clergyman: b. Boston 15 Aug. 1782; d. Cambridge 20 Jan. 1861. He was a son of John Lowell (1743–1802). He was graduated from Harvard in 1800, studied theology at Edinburgh, Scotland, and from 1 Jan. 1806 until his death was pastor of the West (Unitarian) Church of Boston. His ill-health caused his absence in Europe and the East (1837–40), and in his later years his place in the pulpit was largely taken by his colleague, Cyrus A. Bartol (q.v.). He was an able orator and of strong anti-slavery views. A founder and member of the Society of Northern Antiquarians of Copenhagen, he was also secretary of the Massachusetts Historical Society and a corresponding member of the Archæological Society of Athens. Among his published writings are: ‹Meditations for the Afflicted, Sick, and Dying›; ‹Devotional Exercises for Communicants›; ‹Occasional Sermons›; ‹Practical Sermons› (1855).

Lowell, Charles Russell, American soldier: b. Boston 2 Jan. 1835; d. near Middletown, Va., 20 Oct. 1864. He was graduated from Harvard in 1854, at the beginning of the Civil War was manager of the Mount Savage iron-works, Maryland, on 20 April 1861 was made a captain in the 6th United States cavalry, and during the Peninsular campaign, at the close of which he received the brevet of major, commanded a squadron of that regiment. Having been assigned to the personal staff of Gen. McClellan, he distinguished himself at Antietam. In November 1862 he organized the 2d Massachusetts cavalry, of which he became colonel on 10 May 1863. In the winter of 1863–4 he commanded the advanced defenses of Washington, and subsequently he was in command of the provisional cavalry brigade under Sheridan in the Shenandoah, and, ultimately, of the reserve brigade, consisting of three regiments of United States cavalry, the 2d Massachusetts, and a battery of artillery. With this force he fought at Opequen Creek (Winchester) (19 Sept. 1864), and defeated Gen. Rosser's cavalry (9 October). In the battle of Cedar Creek (19 October), he successfully resisted the Confederate attack until the arrival of Sheridan, but later in the action, while leading the final charge, was mortally wounded.

Lowell, Edward Jackson, American author: b. Boston 18 Oct. 1845; d. Cotuit, Mass., 11 May 1894. He was the grandson of Francis Cabot Lowell (1775–1817) (q.v.). He was graduated from Harvard in 1867, was admitted to the Suffolk County bar in June 1872, for a time practised law in Boston, but subsequently devoted himself exclusively to literary work. He was a member of the Massachusetts Historical Society and a fellow of the American Academy of Arts and Sciences. Among his writings are: ‹The Hessians and the other German Auxiliaries of Great Britain in the Revolutionary War› (1884), recognized as standard; ‹The Eve of the French Revolution› (1892); and the section on ‹The Diplomacy and Finance of the Revolution› in Winsor's ‹Narrative and Critical History of America› (1884–9).

Lowell, Francis Cabot, American manufacturer: b. Newburyport, Mass., 7 April 1775; d. Boston 10 Aug. 1817. In 1812 he began his attempts to manufacture cotton cloth, an undertaking then rendered the more difficult by the fact that the war in progress with Great Britain prevented the importation of English machinery. He finally succeeded, by the aid of Paul Moody, a mechanic of Newburyport, in making a suitable loom, and with P. T. Jackson, his brother-in-law, obtained a charter as the Boston Manufacturing Company, with $100,000 capital, and established at Waltham what is believed to have been the first mill in the United States to combine in one establishment the several operations necessary in manufacturing finished cloth from the raw cotton. He was active in introducing into the tariff act of 1816 the clause imposing a minimum duty on imported cotton fabrics. Jackson, subsequent to Lowell's death, bought a portion of Chelmsford and there located mills; and in 1826 the town was incorporated as Lowell.

Lowell, James Russell, American poet, critic and diplomat: b. Cambridge, Mass., 22 Feb. 1819; d. there 12 Aug. 1891. The Lowells were descended from Percival Lowell of Bristol, England, who emigrated to Massachusetts in 1639. Judge John Lowell, grandfather of the poet, contributed a clause to the Bill of Rights which effected the abolition of slavery in the State. One of the poet's uncles, Francis Cabot Lowell, was a leading promoter of manufactures in New England, and is remembered in the name of the city of Lowell. Another uncle, John Lowell, founded the Lowell Institute of Boston. Rev. Charles Lowell, the poet's father, b. 1782, was graduated at Harvard in 1800, and after some study at the University of Edinburgh, was settled over the West Church of Boston, and remained its pastor till his death in 1861. He married Harriet Spence, from a family of Spences in Portsmouth, N. H., who were of Scotch origin. She was the sister of Robert Traill Spence, of naval fame, and is remembered as having the gifts of "a great memory, an extraordinary aptitude for language, and a passionate fondness for ancient songs and ballads," as also a lively sense of humor. There were five children, two daughters and three sons, of whom James Russell was the youngest. He was prepared for college by William Wells, an English schoolmaster, who gave him an excellent drill in the rudiments of Latin. But perhaps the best part of his early education was derived from the unrestricted use of books at home. His father had come into possession of the old Tory mansion, on the Watertown road, later called Elmwood, and its abundant library was well stocked with attractive authors. He entered Harvard College in his 16th year, graduating in the class of 1838. He was not diligent in the prescribed work of the course, but engaged mainly in desultory reading and in writing essays and verse for college societies and magazines. Because of cleverness thus shown, he was made class poet. But the poem, his first considered effort, was not delivered, as the author had been ordered to Concord, for a brief rustication, on account of some neglect of college rules. It was published the next year, under the title of ‹A Poem Recited at Cambridge.› Lowell now entered the Harvard School of Law, took its degree in 1840, and attempted practice. But he was quickly drawn aside to literature, largely through the influence of Maria White, a young lady of Watertown, to whom he became engaged in the latter part of the same year. The poetic gifts and moral enthusiasm of this young woman quickened Lowell's nature, and gave his bent a purpose. In 1841 he collected some of his best poems into a volume called 'A Year's Life,' and inscribed it in covert language to his betrothed. Two years later he began, with Robert Carter, the publication of a literary monthly, called 'The Pioneer,' with Hawthorne, Poe, and Whittier among the contributors, but after three issues it was discontinued. In 1844 occurred his marriage with Maria White; and during the year were published an enlarged edition of the Poems, including 'A Legend of Brittany,' 'Prometheus,' 'Miscellaneous Poems,' and 'Sonnets,' and a volume called 'Conversations on some of the Old Poets.' In 1848 he again published an edition of the Poems, with the addition of the Third Series, including several poems against slavery. Later in the year 'The Vision of Sir Launfal,' 'A Fable for Critics,' and 'The Biglow Papers' came out, the last-named being a reprint of dialect poems furnished to the newspapers of the day. In nothing had Lowell been so effective as in these satires; nothing in the literature of those stirring times attracted more attention. In 1851 he sailed for Europe, with his wife, who was in failing health, and spent a year, mainly in Italy, in study and travel. After their return Mrs. Lowell's health did not improve, and in 1853 she died. A volume of her poems was printed, after her death, for private circulation. In 1855, on the resignation of Professor Longfellow, Lowell was elected Smith professor of the French and Spanish languages, and professor of belles lettres in Harvard College. He spent two years in Europe, to prepare himself more fully, and in 1857 took up the duties of his chair. He married Miss Frances Dunlap, of Portland, Maine, the same year. For the next 20 years his strength was taxed incessantly, being devoted, outside of his service in his college, to editorial and critical rather than poetic writing. He was the first editor of 'The Atlantic Monthly,' and continued in the position for two years. He had an editorial connection with the 'North American Review' from 1862 to 1873, and contributed to it many critical essays of unusual merit. In 1864 he reprinted, in 'Fireside Travels,' a few papers of less substantial worth. In the lighter work of this busy period falls the 'Biglow Papers,' Second Series, which he began in 1862. These were reissued in 1867. In the next year appeared 'Under the Willows,' a collection of his poems written since 1848. In 1869 he published 'The Cathedral,' over which he had long worked, and in 1870 'Among my Books,' a reprint of some of his best essays on literary themes. In 1871 followed 'My Study Windows,' of like contents, and in 1876 'Among my Books,' Second Series. In 1877 Lowell was called to take the post of Ambassador to Spain, and after three years at Madrid was transferred to the court of St. James. Here he won the admiration not only of his countrymen, but also of the more exacting English public, by his executive abilities and his social and oratoric gifts. He received public honors from Oxford, Cambridge, Edinburgh and Bologna, and in 1883 was chosen Lord Rector by the University of St. Andrews. His residence at St. James terminated in 1885, and the affliction of his wife's death came to him, the same year, before return. He resumed to some degree his literary labors, after coming back to Cambridge. He published 'Democracy, and other Addresses' in 1887, and 'Heart's-ease and Rue,' and 'Political Essays,' in 1888. He prepared the public address for the celebration of the 250th anniversary of the founding of Harvard University, and delivered a course of lectures on the Old English Dramatists before the Lowell Institute. In the year before his death he revised and edited a definitive edition of his writings in 10 volumes. Supplemental to these, 'American Ideas for English Readers,' 'Latest Literary Essays and Addresses, 'and 'Old English Dramatists,' were issued posthumously in 1892. Lowell was first and chiefly a man of books, yet without bookishness or pedantry. The most scholarly of all the group then making a name in literature, he was also the most executive and practical. He never lost the point of view of life, never lost sympathy with people, and was perhaps as wise and strong in affairs as in the fields of textual and æsthetic criticism. He lacked the grace and tenderness of Longfellow, but was gifted with deeper insight than any other of the New England school save Emerson.

Consult: Lowell's 'Letters,' edited by C. E. Norton (1894); Underwood, 'Lowell, a Biographical Study' (1893); Scudder, 'James Russell Lowell, a Biography' (1901); Hale, 'James Russell Lowell and His Friends' (1899); E. E. Hale, Jr., 'Lowell' in 'Beacon Biographies': Wendell, 'Literary History of America' (1900).

L. A. SHERMAN,
Of the University of Nebraska.

Lowell, John, American jurist: b. Newburyport, Mass., 17 June 1743; d. Roxbury, Mass., 6 May 1802. He was graduated from Harvard in 1760, studied law, entered practice at Newburyport in 1762, represented that town in the general court in 1777 and Boston in 1779, and was a delegate to the convention of 1780 which framed the constitution of Massachusetts. He obtained the insertion in this document of the clause of the preamble which declares that "all men are born free and equal," with the belief that slavery would thus be abolished in Massachusetts. The supreme court of the State upheld his contention in 1783, and thereby slavery in the State was abolished at his initiative. In 1782-3 he was a delegate in the Continental Congress, and in 1782 was appointed by the congress one of three judges of a court of appeals to hear appeals from courts of admiralty. He was made by Washington in 1789 judge of the United States district court of Massachusetts, and by Adams in 1801 chief justice of the 1st circuit of the United States circuit court. He was a founder of the American Academy of Arts and Sciences (1780), and one of its councillors. He published an oration on James Bowdoin the elder in Vol. II. of the 'Memoirs' of the American Academy; and a poem in 'Pietas et Gratulatio' (1761).

Lowell, John, American publicist: b. Newburyport, Mass., 6 Oct. 1769; d. Roxbury, Mass., 12 March 1840. He was a son of John Lowell (1743-1802) (q.v.). He was graduated from Harvard in 1786, studied law, was admitted to the bar in 1789, retired from practice in 1803, and after travel in the East (1803-6) devoted his attention to literature. He wrote on agriculture

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and theology, but chiefly on politics. In various publications he attacked the War of 1812; and by his pen made himself a valuable aid of the Federalists. His interest in horticulture obtained for him the sobriquet of "the Columella of the New England States"; and he was the first in the United States to build extensive greenhouses on a scientific plan. For many years he was president of the Massachusetts Agricultural Society. Among his pamphlets were: 'Peace Without Dishonor, War Without Hope' (1807); 'Diplomatic Policy of Mr. Madison Unveiled' (1810); 'Candid Comparison of the Washington and Jefferson Administrations' (1810); and 'Mr. Madison's War' (1812).

Lowell, John, American merchant and philanthropist; b. Boston, Mass., 11 May 1799; d. Bombay, India, 4 March 1836. He was the son of F. C. Lowell (1775–1817) (q.v.). He studied at Harvard (1813–5), became a successful merchant in Boston, was several times elected to the Boston common council and the State legislature of Massachusetts, and collected a large and valuable library. After 1830 he passed a large part of his time in travel in foreign lands. By the gift of about $250,000, — then the largest ever made in America by an individual for the endowment of a literary institution, with the exception of Girard's bequest for Girard College — he established in Boston the Lowell Institute, to consist of regular annual courses of free public lectures. The institute was opened in the winter of 1839–40, and has proved exceedingly successful. Consult: Everett, 'Memoir of John Lowell, Jr.' (1840); and Smith, 'History of the Lowell Institute' (1898).

Lowell, Josephine Shaw, American philanthropist: b. West Roxbury, Mass., 16 Dec. 1843; d. New York city, 12 Oct. 1905. During the Civil War she was connected with the work of the Sanitary Commission, and subsequently with labors among the freedmen and with other causes of philanthropy and reform. She was a founder of the Charity Organization Society of New York in 1881, in 1886–9 was commissioner of the State Board of Charities of New York, and in 1899 was appointed to the board of managers of the New York State reformatory for women. Among her writings are: 'Public Relief and Private Charity' (1884); 'Industrial Arbitration and Conciliation' (1893).

Lowell, Maria White, American poet: b. Watertown, Mass., 8 July 1821; d. Cambridge, Mass., 27 Oct. 1853. She was the wife of James Russell Lowell. The best known of her poems are: 'The Alpine Shepherd' and 'The Morning Glory,' which appeared in the collection printed privately at Cambridge in 1855. The death of Mrs. Lowell, occurring the same night that a child was born to Mr. Longfellow, called forth the latter's poem beginning:

> Two angels, one of life and one of death.
> Passed o'er our village as the morning broke.

Lowell, Percival, American astronomer: b. Boston 13 March 1855. He was graduated from Harvard in 1876, for several years resided in Japan, and in 1883 was made secretary and councillor to the special commission to the United States from Korea, the first embassy sent from that country to any Western power. In 1894 he established at Flagstaff, Ariz., the Lowell Observatory, which in 1896 was for a time removed to Mexico City. He was elected a member of the Royal Asiatic Society of Great Britain and Ireland, and a fellow of the American Academy of Arts and Sciences. He lectured before the Lowell Institute in 1893–4 and 1894–5, contributed various articles to the publications of learned societies, and wrote: 'Chosön; The Land of the Morning Calm' (1885); 'The Soul of the Far East' (1886); 'Noto: An Unexplored Corner of Japan' (1891); 'Occult Japan, or the Way of the Gods' (1894); 'Mars' (1895); and 'Annals of the Lowell Observatory' (Vol. I., 1898; Vol. II., 1900).

Lowell, Robert Traill Spence, American Episcopal clergyman; b. Boston 8 Oct. 1816; d. Schenectady, N. Y., 12 Sept. 1891. He was a son of Charles Lowell (q.v.) and a brother of James Russell Lowell (q.v.). He was graduated from Harvard in 1833, for a time studied medicine in the Harvard medical school, and later was in mercantile life at Boston. In 1839 he began the study of theology; went to Hamilton, Bermuda; was there ordained deacon in 1842 and priest in 1843; and became inspector of schools for the colony and domestic chaplain to the bishop. In 1843–7 he was rector at Bay Roberts, Newfoundland, and during the famine of 1846 in that district rendered valuable service as chairman of the relief committee. Having returned to the United States in 1847, he was active in mission work among the poorer classes at Newark, N. J.; was rector of Christ Church, Duanesburg, N. Y., in 1859–69, head-master of St. Mark's school (Southboro, Mass.) in 1869–73, and professor of Latin language and literature in Union College in 1873–9. He published 'The New Priest in Conception Bay' (1858; revised in 1889), in which Bay Roberts appears as "Peterport"; 'Fresh Hearts That Failed Three Thousand Years Ago, and other Poems' (1860); 'Anthony Brode' (1874); 'Burgoyne's March' (1877), written for the Saratoga County celebration at Bemis Heights; and 'A Story or Two from an Old Dutch Town' (1878).

Lowell, Mass., city, county-seat of Middlesex County; at the junction of the Concord and Merrimac rivers, and on the New York, N. H. & H. and the Boston and M. R.R.'s; about 25 miles northwest of Boston. Lowell, formerly Chelmsford, was founded in 1822, by the "Merrimac Manufacturing Company," and named in honor of Francis Cabot Lowell (q.v.). In four years it was incorporated as a town, and in 1836 it was chartered as a city. The city now has an area of over 12 acres. The city is noted for its great number of manufactories and its large annual output of manufactured articles. The power is obtained from the falls of the Merrimac which here descend 32 feet and from the Concord River; but some steam power is used. The "Canal and Lock Company" was organized early in the 19th century, for the purpose of obtaining and supplying power for cotton factories. The canal system was nearly completed in 1825, but the first canals were more like ordinary ditches; now they are walled and fitted with locks and bridges, all of the best construction and latest improvements. They are so well built, that the annual amount spent for repairs is comparatively small. By means of this canal system water-power is furnished to many factories in Lowell, then returned to the Merrimac to be used lower down the stream to turn the wheels for the mills in Lawrence, Haverhill and Newburyport. Coal is so expensive in Lowell that water-power is used extensively; but the large mills are fitted with steam-power machinery that may be used in a dry season.

Some of the manufacturing establishments are woolen and cotton factories, hosiery and knitting mills, carpet and felt factories, bleacheries, dyeing works, machine-shops, patent-medicine works, a cartridge factory, and furniture factories. Lowell has many points of historic and scenic interest and a number of fine public buildings. The educational institutions are the State Normal School, the Rogers Hall School, the Lowell Textile School, Saint Patrick's Academy, a high school, and public and parish elementary schools. The city has the Lowell Hospital, Lowell General Hospital, Saint John's Hospital, Saint Peter's Orphanage, Theodore Edson Orphanage, Ayer Home for Young Women and Children, Saint Patrick's Home for Working Women, and the Old Ladies' Home.

The annual amount of municipal expenditures is about $1,320,000; the principal items are: for schools about $330,000; for hospitals, almshouses, etc., $120,000; for police department, $121,000; for the fire department, $118,000; for municipal lighting, $84,500; for waterworks, $85,000. The waterworks were built in 1873 at a cost of about $2,875,000. There are now about 130 miles of mains. The waterworks are owned and operated by the city. Pop. (1890) 77,696; (1900) 94,969, about 44 per cent of whom are of foreign birth; (1910) 106,294. Consult: Drake, 'History of Middlesex County'; 'Illustrated History of Lowell.'

Lower California. See CALIFORNIA, LOWER.

Lowndes, Lloyd, American capitalist and politician: b. Clarksburg, W. Va., 21 Feb. 1845; d. Cumberland, Md., 8 Jan. 1905. He was graduated from Alleghany College, Meadville, Pa., and from the law school of the University of Pennsylvania. He entered the Maryland legislature in 1871 as a Republican, and from 1895–9 was governor of Maryland.

Lowndes, Marie Adelaide Belloc, English author; b. 1868. She is a sister of Hilaire Belloc (q.v.) and was married to F. S. Lowndes in 1896. She has published 'Life and Letters of Charlotte Elizabeth, Princess Palatine' (1889); 'King Edward VII.' (1901); 'The Philosophy of the Marquise,' a novel in dialogue (1899).

Lowndes, Rawlings, American statesman: b. in the West Indies 1722; d. 1800. His parents removed with him to Charleston when he was very young, and his career was ever after associated with that city. Having studied law he became an associate judge of the colonial court in 1766, and in that position opposed the Stamp Act. He assisted in outlining a new constitution for South Carolina in 1776, and in 1788 became president of the State. He was subsequently a member of the State legislature and vigorously opposed the ratification of the Federal constitutions.

Lowth, Robert, English prelate and biblical scholar: b. Winchester, Hampshire, 27 Nov. 1710; d. London 3 Dec. 1787. Educated at Winchester School and Oxford University, he became professor of poetry in the latter in 1741, and in 1744 was appointed rector of Ovington, Hampshire. In 1753 he published his lectures on 'The Sacred Poetry of the Hebrews,' and became famous as one of the first biblical critics of his age. Ecclesiastical preferments followed, and he was made successively prebend of Durham, bishop of St. David's, (1766), of Oxford the same year, and of London in 1777. In 1783 he declined the archbishopric of Canterbury. In 1778 he published 'Isaiah, a New Translation,' with a preliminary dissertation and notes, which was highly commended.

Lowville, lō'vil, N. Y., village, county-seat of Lewis County; on the New York Central & Hudson River railroad; about 100 miles northwest of Albany and 60 miles north by west of Utica. It is situated in an agricultural section, and the industries of the village are connected chiefly with farm and dairy products. Its trade is principally in hay, grain, vegetables, and the noted Lewis County butter and cheese. The principal buildings are the town-hall, the county buildings, a club-house, and the Lowville Academy. The academy library has about 4,500 volumes. Pop. (1910) 2,940.

Loxodrom'ic Curve, the course which is represented by the path of a ship when her course is directed constantly to the same point of the compass, thereby cutting all the meridians at the same angle.

Loy, Matthias, American Lutheran theologian: b. Cumberland County, Pa., 17 March 1829. He was graduated from the Theological Seminary at Columbus, Ohio, in 1849, and was pastor at Delaware, Ohio, 1849–65. He was editor of the 'Lutheran Standard' (1864–91), and president of the Evangelical Lutheran Synod of Ohio 1860–78, and 1880–94. He has published 'The Doctrine of Justification' (1869); 'Christian Prayer' (1890); 'The Christian Church' (1898); etc.

Loyal Legion of the United States, Military Order of the, was the first society formed by officers in the Civil War, who were honorably discharged. Members are eligible from the army, navy and marine corps. On the day after the assassination of President Lincoln, Col. S. B. Wylie Mitchell, Capt. Peter D. Keyser, M. D., and Lieut.-Col. T. Ellwood Zell met in Philadelphia to arrange for a meeting of ex-officers of the army and navy to adopt resolutions relative to the death of President Lincoln. It was decided to effect a permanent organization, and an adjourned meeting was held for this purpose in the hall of the Hibernia Fire Company in Philadelphia 3 May 1865. There are State commanderies in Pennsylvania, New York, Maine, Massachusetts, California, Wisconsin, Illinois, District of Columbia, Ohio, Michigan, Minnesota, Oregon, Missouri, Nebraska, Kansas, Iowa, Colorado, Indiana, Washington, and Vermont. The total membership in 1910 was 8,902.

Loyal Temperance League, an organization of children founded in 1886, by the Woman's Christian Temperance Union, for the purpose of teaching children the evil effects of alcohol and tobacco. The graduates, who follow a systematic course of instruction, are organized into State legions, holding annual conventions. There are upward of 200,000 members in the United States.

Loy'alists, or **Tories,** in American history, were those persons who remained loyal to Great Britain, during the Revolutionary War. They represented all classes, a majority of them, however, being office holders and members of learned professions. Others were adventurers who adhered to England with the hope of gain or official preferment. At the close of the Revolution the Royalists were estimated at 1,000,000 or a third of the entire population of the colonies. The Whigs took vigorous action against the loyalists, banished many of them under penalty of death and confiscated the estates of others. Between 40,000 and 50,000 loyalists are said to have fled to Canada prior to 1786. Consult: Ryerson, 'Loyalists of America, 1620–1816,' (1880); Van Tyne, 'The Loyalists in the American Revolution' (1902).

Loy'alty Islands, a group in the Pacific Ocean, east of New Caledonia, of which French colony they form a dependency. They consist of the islands Uvea (Uea), Lifu, and Marè, with many small islands. Total area, about 1,040 square miles. Water is scarce, but some fruits, vegetables, and grains are cultivated. The inhabitants are of mixed descent, Melanesian and Polynesian, and nearly all Protestants. Pop. about 20,000.

Loyola, lō-yō'lä, **Ignatius** (Inigo Lopez de Recalde), founder of the order of the Jesuits: b. at the castle of Loyola, Guipuzcoa 1491; d. Rome 31 July 1556. He seems to have been from the first of an enthusiastic temperament, which was fomented by the Spanish romances, in which religion and chivalry are blended, and is said in early youth to have himself written a romance of which the apostle Peter was the hero. In 1505 he became attached as a page to the household of Ferdinand V. His relative Don Antonio Manriquez, duke of Najara, trained him to the profession of arms and his valor was indicated at the siege of Pampeluna, on the occasion of the invasion of Navarre by Francis I. in 1521, when the garrison was induced to hold out by his example alone. Loyola was made a prisoner by the French, having been wounded in both legs by a cannon ball in such a manner as to render him lame for life. He had twice to undergo a painful operation, followed by a long confinement. The only books he found to relieve its tedium were books of devotion and the lives of saints. This course of reading threw him into a state which he has minutely described in his 'Spiritual Exercises,' a devotional book written in Spanish, and which has been translated into many languages. His ambition now turned from a military life, for which he was incapacitated, to imitation of the self-denial of Saint Dominic and Saint Francis. He made pilgrimage to Montserrat in Catalonia, where he hung up his arms before the Virgin and assumed the pilgrim's staff. After dedicating himself to the church at Montserrat he proceeded to the hospital of the Dominican convent of Manresa, where he devoted himself to the care of the poor and sick. After ten months spent at Manresa he proceeded on a pilgrimage to Rome and Jerusalem (1523). His object at this time was the conversion of the infidels, but being refused a permanent residence at Jerusalem by the primate of the church he returned to Spain and attended (1524–7) the schools and universities of Barcelona, Alcala, and Salamanca. In Spain he was several times arrested by the Inquisition under suspicion of heresy, but was always acquitted. He then went to Paris, where, placing himself in the lowest classes, he went through, from 1528 to 1535 a course of general and theological training. Here he formed the first nucleus of the society which afterward became so famous. Under his influence Pierre Le Fèvre, a Savoyard priest, Francis Xavier, professor of philosophy, Lainez, Salmeron, Bobadilla and Rodriguez of Azevedo, students, met together with Loyola on 15 Aug. 1534, in a subterranean chapel of the Abbey of Montmartre, took the sacrament administered by Le Fèvre, and bound themselves together by vows of chastity and poverty, devoting themselves to the care of the church and the conversion of infidels. In 1536 he met the members of this body at Venice with a view to the pilgrimage to Jerusalem, but the war which broke out in 1537 between the Venetians and the Turks prevented the accomplishment of this object. At Venice Loyola became attached to Cardinal Caraffa (Paul IV.), the founder of the order of the Theatines, and proceeded to Rome to procure the recognition of his order, which was granted partially in 1540, and fully three years later, taking the name of the Company of Jesus. Besides the vows of poverty and chastity their vow of obedience bound them to perform unhesitatingly all the commands of the pope. They discarded the peculiar garb by which monastic orders were usually distinguished, and devoted themselves to the highest objects to which a religious society could aspire — the education of youth, the defense of the church, and the propagation of the faith. Besides missionary enterprises for the extension of the church, their chief means of influence were the pulpit, the confessional, and their schools and colleges for training the young. Thus the romantic devotion of Loyola took a practical shape. On 22 April 1541 Loyola was elected general of the order, and drew up its constitution, assisted by the organizing genius of Laynez. He continued to reside in Rome and govern the society he had constituted till his death. He died worn out with the fatigues of his ascetic severities on 31 July 1556. He was beatified in 1607 by Paul V., and canonized in 1622 by Gregory XV. See Jesuits.

Loyson, Charles, shärl lwä-zôṅ (known by his monastic name, Père Hyacinthe), French ecclesiastic: b. Orléans 10 March 1827. He studied in the College of Pau and the ecclesiastical college of Saint Sulpice, was ordained priest in 1850, taught philosophy at the seminary of Avignon and theology at that of Nantes, entered the Carmelite order, and became renowned as a preacher at Lyons, Bordeaux, Nantes, and Paris. But his unorthodox utterances soon drew the censure of ecclesiastical authority, and his superiors prohibited him from preaching. He then left the Order, and refusing to remain silent, he was excommunicated. In 1869 he visited the United States, where he was heartily welcomed. He protested against the dogma of papal infallibility, attended the Old Catholic congress in Munich, and to some extent fraternized with Protestants, but he repeatedly declared that he had no intention of leaving the Catholic Church. In 1873 he became pastor of an Old Catholic church at Geneva, and thus the founder of the Christian Catholic Church of Switzerland. In 1878 he opened in Paris an independent church, the Eglise Gallicane. Among his writings are: 'Le Dimanche et les Classes laborieuses'; 'L'Eglise catholique en Suisse'; 'La Réforme catholique,' and other works.

Lozier, lō'zhėr, **Clemence Sophia** (Harned), American physician: b. Plainfield, N. J., 11 Dec. 1812: d. New York 26 April 1888. In 1829 she was married to A. W. Lozier; in 1849 began the study of medicine, and in 1853 was graduated from the Syracuse Medical College. She entered practice in New York, and there had great success as a surgeon. The New York medical college and hospital for women was founded largely through her efforts, and for many years she was a professor in that institution and dean of its faculty. She was also for four years president of the National Woman Suffrage Society. She was a prominent woman suffragist and active in reform and philanthropic movements.

Lualaba, loo-ä-lä'bä, Central Africa, a head-stream of the Kongo River, which rises near Kabinda on the southern boundary of the Kongo Free State, receives several affluents such as the Lufira and Lubudi, passes through a hilly, forest and lake region, and after a course of about 650 miles, the last 250 of which are navigable, unites with the Luapula (q.v.) at Ankoro to form the Kongo.

Luapula, loo-ä-poo'lä, Central Africa, a river, the chief of the two principal head-streams of the Kongo. It rises as the Chambezi south of Lake Tanganyika, near Fwamba on the Stevenson Road, flows southwest through Lake Bangweolo whence it issues as the Luapula, flows northward through Lake Moero, then northwestward until it unites at Ankoro with the Lualaba (q.v.) to form the Kongo.

Lubang, loo-băng', Philippines, the largest and only inhabited island of the group of the same name lying at the western entrance of the Verde Passage between Luzon and Mindoro, southwest of Manila. The island of Lubang is 17 miles in length from northwest to southeast; area, 51 square miles; area of group 76 square miles. The interior of the island is mostly mountainous, but the coasts are low. The chief town is Lubang on the north coast, which has considerable native trade; the only port safe for all vessels at all seasons of the year is Tilig, on the northeast coast. Civil government was established in these islands in 1901, and in June 1902 they were detached from the province of Cavite and annexed to the province of Marindique. Pop. 3,000.

Lubao, loo-bä'ō, Philippines, a pueblo of the province of Pampangas, Luzon, situated on the northwestern channel of Pampanga delta, 5 miles south of Bacolor. It is the trade centre of an agricultural region. Pop. 21,200.

Lubbock, lŭb'ŏk, **Francis Richard,** American politician: b. Beaufort, S. C., 16 Oct. 1815; d. 22 June 1905. He went to Texas in 1836, held the office of comptroller under the republic of Texas, in 1856 became lieutenant-governor of Texas, and was its governor in 1861–3, whence he was known as the «war governor.» Subsequently he entered the Confederate service, became colonel of cavalry, was aide-de-camp to President Jefferson Davis and was captured with Davis and imprisoned for eight months in Fort Delaware. He wrote ‹Six Decades in Texas› (1900).

Lubbock, John, Baron Avebury, British archæologist and man of science: b. London 30 April 1834. He was educated at Eton and joined the banking business of his father, Sir John William Lubbock (q.v.) in 1848, becoming a partner in 1856. He rose to great eminence in his profession, and was appointed to various honorable and responsible posts in connection with it. He entered Parliament in 1870 for Maidstone in the Liberal interest, and from 1880 till 1900 sat for London University, from 1886 as a Liberal Unionist. In 1900 he was raised to the peerage as Baron Avebury. He is a recognized authority on financial and educational questions, and his name is associated with several important public measures, such as the bank holidays, ancient monuments, shop hours, and public libraries acts. He is still more distinguished as a man of science. His studies have been chiefly directed toward the ancient remains and history of mankind; and the habits of insects, particularly of wasps, ants, and bees. Among his volumes are: ‹Prehistoric Times› (1865); ‹Origin of Civilization› (1870); ‹Origin and Metamorphoses of Insects› (1874); ‹British Wild Flowers in their Relation to Insects› (1875); ‹Addresses: Political and Educational› (1879); ‹Ants, Bees, and Wasps› (1882); ‹Representation› (1885); ‹Flowers, Fruits, and Leaves› (1886); ‹The Pleasures of Life› (1887); ‹The Senses, Instincts, and Intelligence of Animals› (1889); ‹The Beauties of Nature› (1892); ‹The Use of Life› (1894); ‹The Scenery of Switzerland› (1896); and ‹Buds and Stipules› (1898), besides a large number of papers in the transactions of learned societies. He has done much to promote a popular interest in matters of science, not only by making more accessible the work of others, but by extensive personal investigation. He presided over the York meeting of the British Association in its jubilee year (1881), and the address he delivered on that occasion was published separately under the title ‹Fifty Years of Science.› He is connected with a large number of scientific bodies both in the United Kingdom and on the Continent.

Lubbock, Sir **John William,** English astronomer and mathematician: b. Westminster, London, 26 March 1803; d. 20 June 1865. He was graduated from Trinity College, Cambridge, in 1825; became a banker; found an avocation in scientific studies; made particular investigations in physical astronomy and Laplace's theory of probability; was treasurer and vice-president of the Royal Society in 1830–5 and 1838–47; and was the first vice-chancellor of London University (1837–42). Among his writings are: ‹An Elementary Treatise on the Computation of Eclipses and Occultations› (1835); ‹An Elementary Treatise on the Tides› (1839); and ‹On the Gnomonic Projection of the Sphere› (1851).

Lü'beck, Germany, one of the three free city-states (see Free Cities), and a constituent of the German confederation, situated on a low ridge at the confluence of the Wackenitz with the Trave, 38 miles northeast of Hamburg, and 12 miles from the Gulf of Lübeck, on the Baltic. It was anciently surrounded by walls and bastions, which have been leveled and converted into pleasant walks; but it is still entered by four gates, and furnishes striking specimens of the architecture of the 15th and 16th centuries. Among the buildings are the cathedral, a structure of red brick, begun in 1173, surmounted by two spires 416 feet high, and containing a finely carved choir-screen; the Marienkirche (St. Mary's Church), a fine specimen of early Gothic, the Ægidienkirche (St. Giles' Church) and the Petrikirche (St. Peter's Church); the town or senate house, an ancient Gothic building; the Hospital of the Holy Ghost (13th century); the Holstein Gate, with its two lofty towers, etc. There is a public library of about 100,000 volumes. The city has fine municipal waterworks, electric lighting and a system of electric street railroads connecting the suburbs. The manufactures are comparatively unimportant, but the trade is extensive, especially with Hamburg, the Baltic ports, and the interior of Germany. Lübeck possesses a territory of 116 square miles, and includes the port of Travemünde, and several isolated portions in Holstein and Lauenburg. It has a senate of 14 members and a council of burgesses of 120 members. It became an imperial free city in 1226, and about 30 years later it became the head of the Hanseatic League. It is represented by one member in the Bundesrat and one in the Reichstag (q.v.). Pop. of city about 82,098; of city and state about 100,000.

Lübke, Wilhelm, vĭl'hĕlm lüb'kė, German historian of art: b. Dortmund, Westphalia, 17 Jan. 1826; d. Karlsruhe (Baden) 5 April 1893. He studied at Bonn and Berlin; held the chair of architecture at the Building Academy of Berlin in 1857–8; was professor of the history of art and archæology at the polytechnic school at Zürich 1861–6; at Stuttgart, 1866–85; and at the high school in Karlsruhe, 1885–93. Chief among his works are: 'Mediæval Art in Westphalia' (1853), which at once gave him a high place among art-critics; the 'History of Architecture' ('Geschichte der Architektur' 1855), the first popular manual of the subject, and a great success; 'Outlines of the History of Art' (1860, 11th ed. 1891), translated into English by Clarence Cook, 1880; 'History of the Renaissance in France' (1868); 'History of the Renaissance in Germany' (1873); 'History of German Art' (1888); 'Recollections' (1891). He was extremely versatile, and previous to his work in art, gave instruction in vocal and pianoforte music.

Lublin, loo'blĭn, Russian Poland, capital of the government of Lublin; on the Bistritza, about 95 miles southeast of Warsaw. Lublin was, in the 12th century, a place of importance. The union of Poland and Lithuania was decreed at a diet which met here in 1568. There are at present some manufactures, chiefly woolen goods, agricultural implements, and leather. There is a jail with which is connected a government cloth-factory. Lublin has several good educational institutions and a number of ancient buildings. Pop. about 52,000, one half of whom are Jews.

Lu'bricant, any substance applied to machinery or any rubbing surfaces to diminish friction. Lubricants fill the interstices between the particles of the surfaces in contact, and so prevent their interlacement. Tallow is used where the rubbing surfaces are of metal and wood, and even when they are both metal, if they happen to be rough. Oil is more commonly employed for metal surfaces, and the harder and smoother the surfaces, the finer must be the oil. Powdered plumbago has been used for highly polished surfaces. Water is found to be a good lubricant at all rubbing surfaces which happen to be under water. Very many other substances are also in use as lubricants, such as cottonseed oil, olive oil, sperm oil, castor oil and other vegetable oils. Hard lubricants include graphite and soapstone. See also OILS.

Lucan, lū'kạn (MARCUS ANNÆUS LUCANUS), Roman poet: b. Corduba, Spain, 39 A.D.; d. 65. His father, a Roman knight, was the youngest brother of the philosopher Seneca. Lucan went to Rome when a child, and having early obtained celebrity, was forbidden by Nero, who himself aspired to literary honors, to recite in public. This induced Lucan to join the conspiracy of Piso. The plot was discovered, and Lucan, who is said to have informed against his own mother as accessory, was condemned to death. He chose the death of Seneca, and had his veins opened. Of his poems, only his 'Pharsalia' has come down to us, in which he narrates, in ten books, the events of the civil war between Cæsar and Pompey. The poem is unfinished, and as it appears to have been produced at different times, it is uncertain whether it was left unfinished by the author or whether the latter part has been lost. In the earlier portions the liberal sentiments of the author are checked by deference to the emperor, in the latter he is inveighed against in unsparing language. The best editions are Burmann's (Leyden, 1740), Weber's (Leipsic, 1821–31), and those of Haskins (Cambridge, Eng., 1887), Hosius (Leipsic, 1892), and Francken (Leyden, 1896–7). Lucan has been translated into English by Rowe (1718) and by Riley (1853).

Lucania, lū-kā'nĭ-a, Italy, a district of ancient Italy, corresponding nearly to the present province of Potenza and the eastern part of Salerno. The region was mountainous, and covered with extensive forests. The Chones and the Œnotrians were the ancient people of this section; but before the introduction of Christianity into Italy, they had been nearly destroyed. Lucania became Roman territory about 300 B.C.

Lucas, lū'kas, **Daniel Bedlinger,** American lawyer and author: b. Charlestown, W. Va., 16 March 1836. He was graduated from the University of Virginia (Charlottesville, Va.), in 1856; in law from Washington College (Lexington, Va., now Washington and Lee University) in 1858; in the Civil War served in the Confederate army on the staff of Governor Wise of Virginia in the Kanawha Valley, and from 1867 practised law at Charlestown. In 1884–7 he was a member of the West Virginia legislature; in 1887–8 was a United States senator under appointment of the governor; and in 1888–93 was president of the supreme court of appeals of West Virginia. He was a presidential elector on the Democratic ticket in 1872, 1876, 1884, and 1896. He obtained in the South a considerable reputation as a public speaker, and published a 'Memoir of John Yates Bell' (1865); 'Nicaragua and the Filibusters'; and, in verse, 'The Wreath of Eglantine and other Poems' (1869); 'The Maid of Northumberland: A Dramatic Poem' (1879); and 'Ballads and Madrigals' (1884).

Lucas, Edward Verrall, English author: b. 12 June 1868. He was connected with the London 'Globe' 1893–1900 and with the 'Academy' 1896–1901. He has published a popular 'Book of Verses for Children' (1897), as well as other works for young readers; 'The Open Road' (1899); etc.

Lucas, John Seymour, English artist: b. London 21 Dec. 1849. He studied with the wood-carver Gerard Robinson; and painting at the Royal Academy; first exhibited at the Academy in 1872; first made his mark by his 'By Hook or Crook,' shown at Burlington House in 1875; and obtained recognition for the high technical excellence of his work. Among his later canvases are 'Fleeced'; 'For the King and the Cause'; 'Intercepted Despatches'; 'Charles Before Gloucester'; 'After Culloden'; 'The Call to Arms.'

Lucbán, look-băn', or **Lugbang,** loog-băng', Philippines, pueblo of the province of Tayabas, Luzon, 8 miles northwest of Tayabas, the provincial capital. It is in the heart of a mountainous region, and in the surrounding country rice is grown on *sawas* or terraces on the hillsides. It is on the main road, and has a profitable trade. The chief industries are the weaving of fine straw hats from the fibre of the buri palmleaf, and the manufacture of pandanus mats. Pop. 12,800.

Lucca, look'kä (originally LUCAS), **Pauline,** Austrian opera singer: b. Vienna 25 April 1842; d. there 28 Feb. 1908. She made her first appearance in opera in 1859 as Elvira in Verdi's 'Ernani' at Olmütz; at once attained great success on the Continent; and later sang in London (1863–5) and New York (September 1872). Illness impaired her voice and in 1889 she retired. Among her chief parts were those of Margaret, in 'Faust'; Cherubino, in 'Le Nozze di Figaro'; and Zerlina in 'Fra Diavolo.'

Lucca, Italy, the capital of the province of Lucca, and former capital of the ancient Tuscan republic and duchy of Lucca, near the left bank of the Serchio, 37 miles by rail northwest of Florence. Encircled by walls flanked with bastions, it stands in a fertile plain surrounded by the Apennines, and has a striking appearance. It is entered by four gates and is well built. Lucca is an archiepiscopal see, and the seat of several important courts and public offices. It contains numerous antiquities; one of the most interesting is the fish-market, the large oval of which is the Roman amphitheatre; while the buildings around it, though converted into modern dwellings, are in a great measure composed of the ruins of the amphitheatre, and exhibit huge solid arches, and masses of brick and stone, on their original sites. The principal edifices are the *Duomo,* or cathedral, with a magnificent façade, a Romanesque portico, and stained glass of the richest kind; the Church of San Michele, an ancient and imposing structure; the Church of San Frediano, founded in 686, furnishing an interesting specimen of early Christian architecture, and adorned with fine mosaics, frescoes, and paintings; the ducal palace; the Palazzo Borghi, now converted into a poor-house; and an aqueduct, carried from a distance into the city, over 459 arches. The manufactures consist chiefly of silk goods; and there are numerous silk mills. The trade is almost confined to the above articles of manufacture, agricultural produce, and olive-oil, particularly the latter, which bears a high name, and is largely exported.

First an Etruscan, then a Ligurian town Lucca 177 B.C., became a Roman colony. It followed the varied fortunes of northern Italy until about 1115 it was made the seat of a republic. In 1320 it fell under the dominion of Castruccio Castracani, who became Duke of Lucca, and after his death Lucca was sold to Florence. It purchased its liberty from Charles IV. in 1369, and maintained its independence until the French occupation in 1799. In 1814 the Congress of Vienna re-created it a duchy. It became part of the kingdom of Italy in 1860.

Luce, Stephen Bleecker, American naval officer: b. Albany, N. Y., 25 March 1827. He was appointed midshipman from New York in 1841; saw service in various waters and made the circuit of the globe; during the Mexican War was on the Pacific coast; and in the Civil War was commander of the monitor Nantucket, and of the Sonoma, Canandaigua, and Pontiac. In 1884–6 he was president of the naval war college, and in 1886–9 was in command of the North Atlantic station as head of the rear-admirals on the active list. On 25 March 1889 he was retired. He was an associate editor of the 'Universal Cyclopædia,' naval editor of the 'Standard Dictionary,' and author of 'Seamanship' (1863–98), 'Naval Songs' (1889), and 'The Patriotic and Naval Songster.'

Lucena, loo-thā'nä, Spain, an Andalusian city in the province of Cordova, 30 miles southeast of that city, in a picturesque hilly situation. It is well built, has a fine parish church, schools, benevolent institutions, a town-house, a magnificent "paseo" or public promenade, and in the neighborhood are medicinal baths of repute. It manufactures linens, shoes, earthenware, glass, iron, copper, and other metallic vessels, oil, vinegar, brandy, and is in a region noted for its wines, and for stock-raising. Pop. about 22,000.

Lucerne, lū-sėrn' (Fr. lü-sārn), Switzerland, the capital of the canton of Lucerne, and one of the three seats of the Swiss diet, on an acclivity at the west end of Lake Lucerne. The Reuss, which issues from the lake and flows through the town, is crossed by five bridges, two of which are covered and ornamented with curious mediæval paintings, including a Danse Macabre. The town retains its feudal walls and watch-towers, and with the neighboring mountains, including the Pilatus and Rigi, is noted for its picturesque features and scenic beauties, making it a much-frequented tourist centre. Lucerne is well-built, has regular, clean streets, electrically lighted and traversed by street railroads, a town-hall, with collections in art and antiquities; Jesuit college, now the government building; a 15th century parish church, with two slender towers; a Gothic Protestant church; Ursuline convent, with handsome church; a museum and cantonal library of 90,000 volumes; large town hospital, poor-house, deanery, arsenal, a new International Museum of War and Peace, mint, casino, etc.; and besides the college or lyceum, several well-conducted educational establishments. An interesting monument is the 'Lion of Lucerne,' designed by Thorwaldsen, in memory of the Swiss guards who fell in Paris in 1792 while defending the Tuileries, and hewn out of the solid rock. Lucerne has some transit trade, but the manufactures are unimportant; it depends chiefly on the important tourist traffic, accommodating annually over 100,000 visitors. Pop. about 32,000.

Lucerne, Lake of, or **Vier-Waldstättersee** (Lake of the Four Forest Cantons), Switzerland, the largest, and in many respects the most magnificent, Swiss lake, near the centre of the country, 1406 feet above sea-level, surrounded by the cantons of Lucerne, Schwyz, Uri, and Unterwalden. It is irregular in shape, and divided into reaches, separated by narrow straits, giving it the appearance of three distinct lakes. The extreme length from west to south through its centre is 25 miles; average width, 3 miles; extreme width, 9 miles; while the depth varies from 300 to 900 feet. It presents every variety of lake scenery. In the upper reach, lofty mountain masses, including Pilatus and the Rigi, tower above the lake, and descend in sheer precipices to its very edge. Owing to the violent storms which suddenly burst over the lake, its navigation is dangerous. Steamers ply regularly upon it. The Reuss River enters the lake at Flüelen and flows out of it at Lucerne. Cut out of the solid rock on the eastern shore is the Axenstrasse, one of the most beautiful of lake-shore roads.

Lucerne, the European term for the fodder plant called in America alfalfa (q.v.).

Luchaire, Achille, ä-shēl lü-shär, French historian: b. Paris 24 Oct. 1846; d. 14 Nov. 1908. He was professor in the Bordeaux faculty of letters; was made a professor at Paris, where in 1889 he obtained the chair of mediæval history. In addition to studies of the Basque language, such as 'Noms de Lieux du Pays Basque' (1872), and 'De Lingua Aquitanica' (1877), he published a comprehensive work on the Gascon dialects, 'Etudes sur les Idiomes pyrénéens de la Région française' (1879), crowned by the Academy, and several historical narratives, such as 'Institutions monarchiques de la France sous les premiers Capétiens' (1884), and 'Les Communes françaises à l'Epoque des Capétiens directs' (1890).

Lucian, lū'shĭ-ạn, Greek author: b. Samosata, Syria, about 125 A.D.; d. Egypt toward the close of the 2d century A.D. He went to Antioch and devoted himself first to the law and afterward to rhetoric, and traveled in several countries (among others, Greece, Italy, Spain, and Gaul) as a lecturer. On returning home, probably about his 40th year, he abandoned the profession of rhetoric, which he seems partially to have resumed in his old age, and confined himself to philosophy and literature. He lived to an advanced age, and was at a late period of his life made procurator of part of Egypt. The works of Lucian, of which many have come down to us, are narrative, rhetorical, critical, satirical, mostly in the form of dialogues. The most popular are those specifically known as the 'Dialogues,' in which he derides the popular mythology and the philosophical secrets, particularly his 'Dialogues of the Gods' and 'Of the Dead.' These have given him the character of the wittiest of ancient writers. He seems not to belong to any system, but attacks imposture and superstition freely and boldly where he finds them. The Epicureans, who, in this respect, agree with him, are therefore treated with more forbearance. The Christian religion, of which, however, he knew little, and that only through the medium of mysticism, was an object of his ridicule. His writings were once largely studied as text-books, but his diction is not of the best. Among editions of his works may be mentioned Lehmann's (1822–9), F. Fritsch's (1882–5), incomplete; and Sommerbrodt's (1886–99). The most complete English translation is by Howard Williams (1888, in Bohn's series), and there are also renderings by Francklin (1781) and Tooke. Consult: Croiset, 'Essai sur la Vie et les Œuvres de Lucien' (1882).

Lucifer, lū'sĭ-fėr, (1) in ancient astronomy, the morning star. A name given to the planet Venus when she appears in the morning before sunrise. When Venus follows the sun, or appears in the evening, she is called Hesperus, the evening star; (2) a name commonly given to Satan, the prince of darkness; (3) a term originally applied to matches tipped with a mixture of chlorate of potash and sulphuret of antimony, which were inflamed by friction on a piece of emery paper. These have been superseded by a variety of mixtures containing phosphorus.

Luciidæ, lū-sī'ĭ-dē, or **Esocidæ,** the pike and pickerel family of bony fishes. These fishes have an elongated, somewhat compressed, powerful body, with rather small cycloid scales, an imperfect lateral line; the head and snout prolonged and depressed, the mouth large, and lower jaw longest. The mouth is filled with strong teeth, and these fishes are the fiercest carnivores of the fresh waters. The family is widely distributed in Northern waters, and may be traced back to the Miocene Age. See Pike.

Lucile, lū-sēl', an epic poem by Lord Lytton (q.v.) (Owen Meredith) published in 1860. The narrative was founded upon a French novel.

Lucilius, lū-sĭl'ĭ-ŭs, **Gaius,** Roman author: b. Suessa 180 B.C.; d. Naples 103 B.C. He was grand-uncle to Pompey the Great on the maternal side. He served his first campaign against Numantia under Scipio Africanus, with whom he was very intimate. He is considered the inventor of the Roman *satira,* because he first gave it the form under which this kind of poetry was carried to perfection by Horace, Juvenal, and Persius. His satires were superior, indeed, to the rude productions of Ennius and Pacuvius, but he in turn was surpassed by those who followed him. Horace compares him to a river which carries along precious dust mixed with useless rubbish. Of thirty books of satires which he wrote only 940 fragments have been preserved. In his lifetime these satires had an uncommon popularity. Consult the edition by Lachmann and Vahlen (1876); also Müller, 'Leben und Werke des Gaius Lucilius' (1876).

Lucina, lū-sī'nạ, in Roman mythology, the goddess of light, a surname of Juno (according to some of Diana; according to others the name of a daughter of Jupiter and Juno), derived from the root of *luceo* (I shine). Her festival was celebrated 1 March, on which occasion the matrons assembled in her temple, adorned it with flowers, and implored a happy and brave posterity.

Lucius, lū'shĭ-ŭs, the name of three popes, as follows:

Lucius I.: d. March 254. He succeeded Pope Cornelius on 23 June and by some authorities is said to have suffered martyrdom under Gallus, but this cannot be proved.

Lucius II. (GHERARDO CACCIANEMICI, gā-rär'dō kä"chē-ä-nä-mē'chē): d. 15 Feb. 1145. He was legate to Germany from Honorius II., supported Innocent II. against the antipope, Anacletus II., and became chancellor of the Holy See. In 1144 he succeeded Celestine II., but was unsuccessful in quelling revolts against the papal authority in Rome and while heading his troops to suppress a disturbance, was killed by a paving stone thrown from the mob.

Lucius III. (UBALDO ALLUCINGOLI, oo-bäl'-dō äl-loo-chēn'gō-lē): d. Verona 25 Nov. 1185. He was the cardinal-bishop of Ostia and became pope 1 Sept. 1181. He was the first pope elected solely by the cardinals. The emperor Frederick Barbarossa having claimed the estates bequeathed to the papacy by Matilda of Tuscany, Lucius demanded their surrender. Frederick refused and the quarrel ended in the expulsion of Lucius from Rome. He died an exile in Verona.

Luck of Edenhall, The. See EDENHALL.

Luck of Roaring Camp, The, a celebrated short story of California mining life written by F. Bret Harte (q.v.), which was first published in the 'Overland Monthly' in 1869. The story attracted attention in the East and appeared in book form the following year. It is perhaps the most notable of the many short stories of Western life written by this author.

Luck'now, India, the capital of Oudh, 580 miles northwest of Calcutta, on both banks of the Gumti, here spanned by two native and two British built bridges. The city is connected by the Oudh and Rohlkund line with the general Indian railway system. Lucknow has an imposing appearance at a distance which a nearer view fails to realize. The principal buildings are: the Kaiserbagh palace, built in 1850, now occupied as government offices and forming a gorgeous pile of domes, pinnacles, terraces and fountains; the Imâmbara or holy palace, where Asuf ud Douelah is buried, now an arsenal; the great mosque or Jama Masjid; and the Hoseinalad or small Imâmbara with the mausoleum of Mohammed Ali. The Martinière College for half-caste children is a striking building founded by Claude Martin, a French soldier who became a general in the East India Company; other educational institutions include Canning College and several English schools, libraries and mission churches. Lucknow was one of the chief seats of the Indian Mutiny (q.v.) and the residency, the Secunder Bagh, and the Alumbagh where Havelock is buried are reminiscences of the siege. Pop. about 270,000. Consult: Innes, 'Lucknow and Oudh in the Mutiny' (1895).

Luckock, Herbert Mortimer, English clergyman: b. Great Barr, Staffordshire, 11 July 1833. He was graduated from Jesus College, Cambridge, was twice vicar of All Saints, Cambridge, and was rector of Gayhurst and Stoke Goldington. Subsequently he was residentiary canon of Ely and principal of the Ely Theological College, and in 1892 became dean of Lichfield. Among his writings are: 'Tables of Stone'; 'The Intermediate State'; 'Footprints of the Apostles'; and 'Old and New Testament Sermons.'

Lucretia, lū-krē'shĭ-ạ, Roman matron of distinguished virtue, whose ill-treatment by Sextus Tarquin led to the destruction of the kingdom, and the formation of the republic of Rome. She was the wife of Collatinus, a near relation of Tarquin, king of Rome. Sextus Tarquinius, who contrived to become a guest in the absence of her husband, whose kinsman he was, found means to reach her chamber in the middle of the night, and threatened, unless she gratified his desires, to stab her, kill a slave, place him by her side, and then swear that he had slain them both in the act of adultery. The fear of infamy succeeded. She afterward summoned her husband, father, and kindred, and after acquainting them with the affair stabbed herself to the heart. The story has been variously adapted by poets and romancers.

Lucretius, lū-krē'shĭ-ŭs, **Carus Titus,** Roman author: b. probably 97 B.C.; d. 53 B.C. About his life almost nothing is known. He is supposed to have studied Epicurean philosophy at Athens. He is said to have been made insane by a philtre, in his lucid intervals to have produced several works, and to have committed suicide in his 44th year. We possess of his composition a didactic poem, in six books, the 'De Rerum Natura,' in which he exhibits the cosmical principles of the Epicurean philosophy with an original imagination, and in forcible language. The work is in six books, revised by Cicero, and is entire but, evidently, not complete. The theory of corpuscles and their properties; the origin of the vital and intellectual principles; of the senses; of the world and the movements of the heavenly bodies; of the rise and progress of society; and of arts and sciences, with other expositions of natural phenomena, are successively treated. Lucretius' purpose was to free his readers from the fear of death which he believed to be bound up with the superstitions of the popular religion. As a work of art his poem has received the unanimous praise of critics for the skill with which the most unyielding materials are reduced to a poetic diction full of life and sustained majesty. It has influenced the foremost English poets. (See Tennyson's poem 'Lucretius'). The principal editions are those of Lachmann (3d edition, Berlin, 1866), and Munro, with an English translation (3 vols.; revised edition by Duff, 1886). The poem has also been translated into English by Creech, Busby, and Good.

Lucullus, lū-kŭl'ŭs, **Lucius Licinius,** Roman soldier of the 1st century B.C. When a young man he served with distinction in the Marsic war, and accompanied Sulla as quæstor into Asia on the breaking out of the Mithridatic war, 88 B.C. He expelled Mithridates from Chios and Colophon and defeated him off Tenedos. After peace had been concluded with Mithridates he remained in Asia till 80 B.C. In 79 he was elected curule ædile, an office which he held in conjunction with his younger brother. Subsequently he held the office of prætor. On the conclusion of this magistracy he went to Africa, the administration of which province he conducted with ability and impartiality, and in 74 B.C. obtained the consulship with M. Aurelius Cotta. As consul he maintained the constitutional laws of Sulla. On the breaking out of the war with Mithridates he obtained the proconsulship of Cilicia and the command of the army. He vanquished the squadron of Mithridates near the island of Lemnos, and this victory enabled him to drive all the other squadrons of Mithridates from the Archipelago. The generals of Lucullus subdued meanwhile all Bithynia and Paphlagonia. Lucullus, again at the head of his army, although overcome by Mithridates in a battle, soon acquired such advantages that he finally broke up the hostile army, and Mithridates himself sought protection in Armenia. Lucullus now changed Pontus into a Roman province. Tigranes, king of Armenia, refusing to surrender Mithridates to the Romans, Lucullus marched against Armenia and vanquished Tigranes 69-8 B.C. Mithridates, however, contended with varying fortune, till Lucullus was prevented from effectively continuing the war by the mutiny of his soldiers. Lucullus was deprived of the chief command, which was bestowed first on Glabrio, and afterward on Pompey, and recalled 66 B.C. After a delay of three years he succeeded in procuring the merited recognition of his services in a public triumph. He laid out his gardens at Rome with such splendor that they became proverbial, and Pompey called him the Roman Xerxes.

Lucy, Henry W., English journalist: b. Crosby, near Liverpool, 5 Dec. 1845. He was for a time a member of the Shrewsbury *Chronicle* staff; in 1870-3 was connected with the *Pall Mall Gazette* (morning edition); and from 1873 with the *Daily News,* of which — with the exception of the period January 1886-July 1887, when he was editor-in-chief — he was the parliamentary correspondent. He visited the United States in 1883, on his way around the world; an account of which journey appeared in the New York *Tribune* in the form of letters, subsequently collected as ‘East by West’ (1885). On the death of Tom Taylor (q.v.) Lucy continued the former's ‘Essence of Parliament’ in *Punch* as ‘The Diary of Toby, M. P.’ Among his books are ‘Men and Manners in Parliament’ (1874); ‘A Diary of Two Parliaments’ (1885-6), and ‘Gladstone’ (1896).

Lucy, Sir Thomas, English landed proprietor: b. 1532; d. Charlecote 7 July 1600. He was educated by John Foxe (q.v.), the famous martyrologist; and he followed the Puritan sentiments of his tutor. In 1552 he came into possession of great estates in Warwickshire, in 1558-9 rebuilt the manor-house, which still exists, an excellent specimen of the Tudor style. He was knighted in 1565, and elected M. P. for Warwick in 1571 and 1584. His chief interest is in his alleged connection with Shakespeare (q.v.) whom he is said, in a story dating from the 17th century, to have prosecuted for deer-stealing. This story is now thought to be based on fact, though burdened with false details; and Shakespeare is believed undoubtedly to satirize him as Justice Shallow in ‘The Merry Wives of Windsor.’

Lud'dites, in British history, a name given to rioters in 1811-16, in Yorkshire, Lancashire, and Nottinghamshire, in England, who attributed the prevailing distress to the introduction of machinery in manufactures, and did a great deal of damage in destroying it. For a time these counties were in a perpetual state of disturbance, but on the return of prosperity the riots ceased.

Lud'ington, Mich., city, county-seat of Mason County; on Lake Michigan and Marquette River. It is the terminus of the Pere Marquette railroad; about 85 miles northeast of Milwaukee, Wis., 130 miles northwest of Lansing, the capital of Michigan, and 61 miles from Manitowoc on the opposite side of the lake. It has regular steamer communication with the large ports on Lake Michigan, and direct freight connection, by ferry, with Manitowoc, Wis. It was settled in 1851, incorporated in 1867, and chartered as a city in 1874. The principal industries are connected with the manufacture and shipment of lumber. There are large lumber mills, game-board factories, furniture and clothes-pin factories. Lumber, grain, flour, salt, and fruit are among the articles shipped to outside markets. The city has many guests in the summer months, attracted by the cool climate and opportunities for fishing in the several lakes nearby. The Epworth League Training Assembly has nearby grounds and cottages. Pop. (1910) 9,132.

Charles T. Sawyer.

Ludlow, lŭd'lō, **Edmund,** English leader of the Republican party in the civil wars of Charles I.: b. Maiden Bradley, Wiltshire, about 1617; d. Vevay, Switzerland, 1692. He was graduated from Trinity College, Oxford, in 1636; fought at Edgehill in 1642; in 1646 was elected to Parliament from Wiltshire; and in December 1648 was one of the chief promoters of ‘Pride's purge’ (q.v.). He was one of the judges who signed the death-warrant of Charles I., sat in the council of state in 1649-50, and was lieutenant-general of the horse in Ireland and a commissioner for the civil government of that country in 1650-5. In 1656, upon the proclamation of Cromwell as lord protector, he declined to recognize Cromwell's authority, or to give security to keep the peace. Having been allowed to go into retirement in Essex, he was elected to Parliament for Hindon in 1659, and upon the recall of the Long Parliament became a member of the committee of safety (7 May), of the council of state (14 May), and commander-in-chief of the Irish army, with rank of lieutenant-general (4 July). He was impeached upon the Restoration (1660), surrendered, was allowed his liberty on providing sureties, and escaped to Switzerland. His ‘Memoirs’ (1698-9) furnish a good account of the opposition to Cromwell and of the factional troubles which overthrew the republic.

Ludlow, Fitzhugh, American journalist: b. Poughkeepsie, N. Y., 11 Sept. 1836; d. Geneva, Switzerland, 12 Sept. 1870. He was graduated from Union College in 1856, in 1858-9 studied law in New York, in 1859 was admitted to the bar, but from 1860 devoted himself exclusively to literature. In 1860-1 he was connected with the *World* and the *Commercial Advertiser,* for a time was dramatic, art and musical critic of the Evening *Post,* to which he long contributed, and held a similar post as critic on the ‘Home Journal.’ In 1863 he journeyed across the plains to Oregon and California, and in an article styled ‘Through Tickets to San Francisco,’ laid out a route for a Pacific railroad largely identical with that later followed. He was among the earliest contributors to ‘Northern Lights’ of Boston, upon the establishment of that magazine. Among his works are: ‘The Hasheesh Eater: Being Passages from the Life of a Pythagorean’ (1857); ‘Little Brother and Other Genre Pictures’ (1867); ‘The Opium Habit’ (1868); and

‘The Heart of the Continent: A Record of Travel’ (1870).

Ludlow, James Meeker, American Presbyterian clergyman and author; b. Elizabeth, N. J., 15 March 1841. He was graduated from Princeton in 1861, from the Princeton Theological Seminary in 1864, entered the Presbyterian ministry and was pastor of the First Presbyterian Church of Albany 1864–8, and of the Collegiate Reformed Church of New York in 1868–77. His subsequent pastorates were that of Westminster Church, Brooklyn, N. Y., (1877–85) and that of the First Presbyterian Church of East Orange, N. J. (from 1886). In 1885 he declined the presidency of Marietta College (Ohio). His works are: ‘My Saint John’ (1883); ‘Concentric Chart of History’ (1885); ‘The Captain of the Janizaries’ (1886); ‘A King of Tyre’ (1891); ‘That Angelic Woman’ (1893); ‘History of the Crusades’ (1896); and ‘Baritone's Parish’ (1897).

Ludlow, John Malcolm, English author: b. Nimach, India, 8 March 1821. He was educated at the College Bourbon, Paris, became a barrister of Lincoln's Inn, London, in 1843, and practised as a conveyancer till 1874. He was chief registrar of Friendly Societies, 1874–91, and has published ‘Letters on the Criminal Code’ (1847); ‘The Master Engineers and Their Workmen’ (1852); ‘British India: Its Races and Its History’ (1852); ‘Thoughts on the Policy of the Crown Toward India’ (1859); ‘Sketch of the History of the United States from Independence to Secession’ (1862); ‘President Lincoln Self-Portrayed’ (1866); ‘The War of American Independence’ (1876); etc.

Ludlow, Roger, American colonial statesman: b. Dorchester, England, 7 March 1590; d. Virginia about 1665. He was by profession a lawyer, came to Boston in 1630, was there assistant to the general court of Massachusetts in 1630–4, in 1634 became deputy governor, but was defeated for the post of governor, removed with a Massachusetts colony to Windsor, Conn., and was, it is thought, the first practising lawyer in Connecticut. In 1639 he was a member of the convention for preparing a constitution, and the document is believed to have been drafted by him. In Connecticut also he was made deputy governor, and here, too, John Haynes, who had defeated him for the governorship in Massachusetts, was again victorious in the gubernatorial election. In chagrin Ludlow sought to evade his «evil genius,» as he styled Haynes, by founding the town of Fairfield. Here he held each public office of any importance, was a commissioner to the New England congress, and revised the laws of Connecticut (1672). The Manhado Indians having threatened Fairfield, the citizens declared war against the Dutch, at whose instigation the savages were believed to be acting; and Ludlow was made captain of the forces. The New Haven general court, however, quashed this proceeding, and punished Ludlow's subordinate officers. Ludlow then (1654) withdrew in high dudgeon with all the town records to Virginia, where he quite disappeared.

Ludlow, William, American soldier: b. Islip, Long Island, N. Y., 27 Nov. 1843; d. Convent, N. J., 30 Aug. 1901. He was graduated from West Point in 1864, entered the engineer service, was chief engineer of the 20th corps in the Georgia campaign (July–September, 1864), in 1864–5 was engineer of the army in Georgia, was assistant engineer on Sherman's staff in the «March to the Sea» and in the Carolinas, and 13 March 1865 was brevetted lieutenant-colonel, U. S. A., for meritorious conduct in the Carolinas campaign. After various service, he was chief engineer of the department of Dakota in 1872–6, engineer in charge of the Delaware River and harbor improvements and defenses in 1882–3, by authority of Congress chief engineer of the Philadelphia water department in 1883–6, and was at different times in charge of lighthouse districts and engineering work. In 1895 he became president of the Nicaragua canal commission and 13 August was promoted lieutenant-colonel of engineers in command of the lighthouse depot. Commissioned brigadier-general of volunteers 4 May 1898, he became engineer-in-chief of the American army in the field in the Spanish-American war, served in the Santiago campaign, was made major-general of volunteers 7 Sept. 1898, and from 13 Dec. 1898 to April 1900 was military governor of Havana, in the rehabilitation of which city he took an important part. On 13 April 1899, he became brigadier-general of United States volunteers, and on 21 Jan. 1900 brigadier-general United States army. As president of the board of officers appointed for the consideration of the establishment of an army war college, he visited France and Germany for purposes of study. In 1901 he was ordered to the Philippines as commander of the department of Visayas, but immediately returned on sick-leave. He wrote: ‘Explorations of the Black Hills and Yellowstone Country’; and ‘Report of the United States Nicaraguan Canal Commission.’

Ludwig Salvator von Toscana, lood'vĭg săl-vä'tōr fōn tŏs-kä'nä, Archduke of Austria, Austrian traveler: b. Florence 4 Aug. 1847. He was the son of Leopold II., Grand Duke of Tuscany. His principal writings, all illustrated by himself and most of them published anonymously, are: ‘Levkosia, Capital of Cyprus’ (1873); ‘Yacht Voyage to the Syrtes’ (1874); ‘Los Angeles in Southern California’ (2d ed. 1885); ‘The Caravan Route from Egypt to Syria’ (1878); ‘The Balearic Islands,’ superbly illustrated (7 vols., 1869–91); ‘Around the World without Intending It’ (4th ed. 1886); ‘Paros and Antiparos’ (1887); ‘The Lipari Islands’ (1893).

Lufft, Hans, hänts looft, German printer and publisher: b. 1495; d. 1584. He printed the first complete edition of Luther's Bible, at Wittenberg, in 1534. He also printed other works of Luther, and more than 100,000 copies of the Bible were issued from his press. See Lotter Family.

Lugano, loo-gä'nō, Switzerland, town, in the canton of Ticino, on the north shore of Lake of Lugano; about 15 miles northwest of Lake Como. Its principal edifices are several churches, one, Santa Maria degli Angioli, contains a fresco of the «Passion,» by Bernardino Luini, convents, a hospital, and a theatre. The manufactures are chiefly spun silk and silk goods. The transit trade is considerable. Till 1881 it was, alternately with Locarno and Bellinzona, the seat of the legislature of the canton of Ticino. Pop. 10,000.

Lugano, Lake of (Latin, *Ceresius Lacus*), is partly in the Swiss canton Ticino and partly in Italy; between Lakes Como and Maggiore, into the latter of which it discharges its waters. It is of very irregular shape, a narrow body which throws out arms in all directions. Its length is about 20 miles, its breadth about one and one-half, and its depth about 300 feet. Its scenery is very wild and beautiful.

Lug'ger, the former name for a small vessel not unlike the schooner of the present day; having two or more lug-sails, that is fore-and-aft sails set on one yard hung obliquely to the mast at one-third its length.

Lug'worn, or **Lobworm,** a marine annelid (*Arenicola piscatorum*), dwelling in burrows on sandy beaches of the European coast, and in Great Britain much used as bait by anglers.

Luini, Bernardino, bĕr-när-dē'nō loo-ē'nē, Italian painter: b. Luino, on the Lago Maggiore, between 1475 and 1480; d. soon after 1533. He was perhaps the most distinguished representative of the Milanese school, and between 1500 and 1533 was active as a fresco and easel painter in Milan and other places of northern Italy. He began his studies as the pupil of Ambrogio Vorgognone, whose influence is plainly seen in his ‘Pietà’ in the church of Santa Maria della Passione at Milan, though the blandness and delicacy of the early Milanese school is in his work somewhat animated and vitalized by the spirit he derived from the study of Leonardo da Vinci, under whose name some of his riper work has frequently gone. But though his frescoes are full of spiritual faces, and distinguished by the tenderest coloring, and the most lifelike movement, he never quite made his own the grandeur in composition and passionate energy which distinguish the paintings of Leonardo. Most of his productions are found in Upper Italy. Many of his easel pictures are to be seen in the Ambrosiana (library), Brera (palace), and in private galleries at Milan; others in the cathedral at Legnano. In the Uffizi at Florence is his ‘Beheading of John Baptist.’ His chief work is ‘The Enthroned Madonna with Saint Anthony and Saint Barbara’ (1521), a magnificent fresco in the Brera. Other examples of this painter are now in the Palazzo Sciarra at Rome, as well as in the Louvre, the National Gallery of London, and the Berlin Museum.

Luise, loo-ē'zė, **Auguste Wilhelmine Amalie,** queen of Prussia: b. Hanover 10 March 1776; d. Strelitz 19 July 1810. She lost her mother in her 6th year and was brought up in charge of her grandmother at Darmstadt. In her 17th year she was married to the crown prince, afterward Frederick William III., of Prussia. On her husband's accession to the throne she won all hearts by her beauty, gracefulness, and kindness of disposition. Her highest happiness was found in her husband and children, but she was also a queen who has left a deep impression on the annals of the Prussian court. In her travels with the king through the provinces she was constantly engaged in helping the poor and unhappy. When the war of 1806 broke out she accompanied her husband to Raumburg and, after the disaster of Jena, to Königsberg and Memel, setting an example to all by her unbroken fortitude. Before Tilsit she hoped to win from Napoleon more favorable conditions for her beloved country, and interceded with the conqueror in vain. She is a household name to this day in Prussia, and the Order of Luise was founded in her honor by her husband, the king, 3 Aug. 1814. It is the object of this order to honor patriotic and benevolent women of the Prussian nation. The badge is a gold cross enameled in black. In the centre is a shield of blue on which the letter L is enclosed in a circle of stars. The ribbon is white, striped with black. Consult: Hudson, ‘Life and Times of Louisa, Queen of Prussia’ (1874); and Adami, ‘Luise, Königin von Preussen’ (1888).

Luke, Saint, author of the third gospel, and the Acts of the Apostles. His place and date of birth are equally unknown, but it is certain from Col. iv. 11 as compared with 14, that he was a Gentile. Eusebius calls him a native of Antioch, but there is no authentic evidence of this. He was a physician, and his works show him to have been an educated man, with a literary style distinctive and often pregnant and picturesque. He possessed a wide acquaintance with eastern Mediterranean places, their customs, forms of worship, and typical characteristics. Tradition asserts that he was a painter, but this may be merely a fanciful tribute to the manner in which he groups and sets off the incidents of his Gospel with an almost pictorial coloring and a symmetry which show true artistic sense of proportion. According to the Acts of the Apostles he appears as the companion of St. Paul from Troas to Philippi, and some have supposed that his services as a physician were needed by St. Paul, whose frequent sicknesses are alluded to in his epistles. He probably remained at Philippi, the key to Europe in the Apostolic programme, from 52 to 58, and rejoining St. Paul there was his companion till the narrative of his journeys comes to an end. He was most likely in Palestine during St. Paul's imprisonment at Cæsarea (58–63), and then made his researches into the Gospel history (Luke i. 1–4). As he was not an eye witness of Christ's life, he cannot have been one of the seventy, as Epiphanius of Salamis supposes. Of his life after the death of St. Paul absolutely nothing is recorded. We know from the epistles of St. Paul that he was with that apostle during the latter's imprisonment in the Mamertine prison at Rome, from which his leader went forth to martyrdom. In art he is represented with an ox lying near him, and this beast of sacrifice is sometimes called his emblem; or as painting the portrait of the Virgin, or surrounded by the implements of the painter, or robed like a learned physician. According to some records he preached in Bithynia, and St. Jerome says he lived to the age of 84. See GOSPELS; ACTS OF THE APOSTLES.

Luke, Gospel of. See GOSPELS.

Luke of Leyden (LUCAS VAN LEYDEN, properly LUCAS JACOBSZ), one of the founders of the Dutch school of painting: b. Leyden, 1494; d. there 1533. In earlier life he was taught painting by his father, Huig Jacobsz, and afterward by Cornelius Engelbrechten. At 9 he began to engrave, and in his 12th year astonished all judges by a painting, in water-colors, of St. Hubert. In his 15th year he produced several pieces, composed and engraved by himself, among which the ‘Temptation of St. Anthony,’ and the ‘Conversion of St. Paul,’ in regard to composition, characteristic expression, drapery, and management of the graver, are models. After this he executed many paintings in oil, water-colors, and on glass; likewise a multitude of engravings, which spread his fame widely. He formed a friendly intimacy with the celebrated John of Mabuse and Albert Dürer, who visited him in Leyden. His overwork at last resulted in hypochondria and he imagined himself poisoned by envious painters, and hardly left his bed for the last six years of his life. The fullest and most beautiful collection of engravings by this master is in the library at Vienna. His paintings are scattered through the galleries of London, Berlin, Rome, as well as in Holland, where is his masterpiece, ‘Mount Calvary,’ a composition containing some 80 figures.

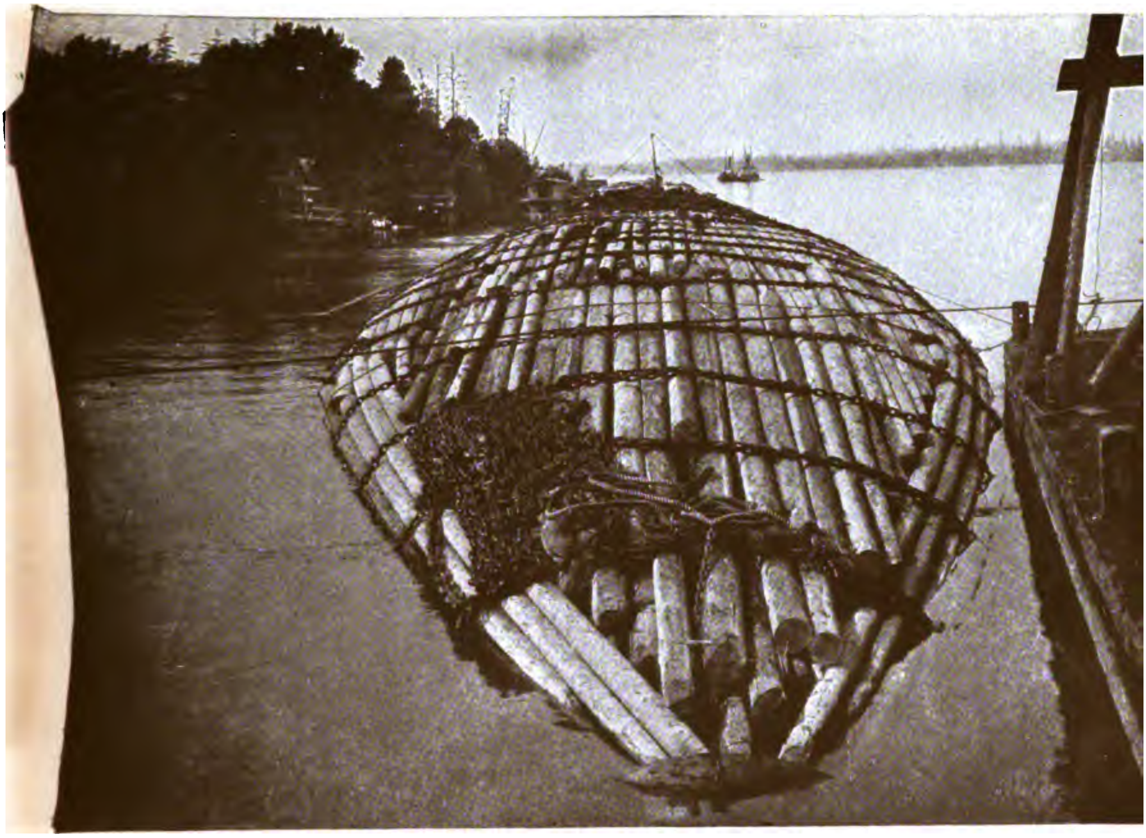
Lully, lŭl'ĭ, **Lull,** or **Lul, Raimon** (Doctor Illuminatus), Spanish scholastic: b. Palma, Majorca, 1235; d. at sea in sight of Palma 1315. After having been attached to the court of James I. of Aragon, he retired to a cell on his estate, where he lived as an ascetic. Encouraged by visions, he came to believe himself appointed to refute Mohammed and convert the Moslems to Christianity, and studied Latin, Arabic, and logic in preparation for this work. His ‘Ars Demonstrativa Veritatis’ was devised as an infallible and universal logical method to be used in making conversions, for the purpose of proving that the mysteries of faith were not contrary to reason. Lully believed that his method was destined to supplant the scholastic logic of the Middle Ages. His history now becomes a record of ceaseless travel. He endeavored without success to obtain aid from Pope Nicholas in establishing colleges for the study of Oriental languages. The Ars Lulliana consists mainly in categorizing ideas and combining them mechanically, by which means Lully thought to exhaust their possible combinations. The method was taught and commented on in some schools of little influence in Spain, France, and Italy, but it is hardly necessary to say that it never took root or produced any direct effects. Lully's works are very numerous. A collected edition is that begun by Galizinger (1521-42); Vols. VII. and VIII. never published). Consult: Erdmann, ‘Grundriss der Geschichte der Philosophie’ (2d ed. 1869).

Lumba'go (from Latin *lumbus,* loin), a painful affection of the muscles and tendinous attachments of the lumbar region. See Rheumatism.

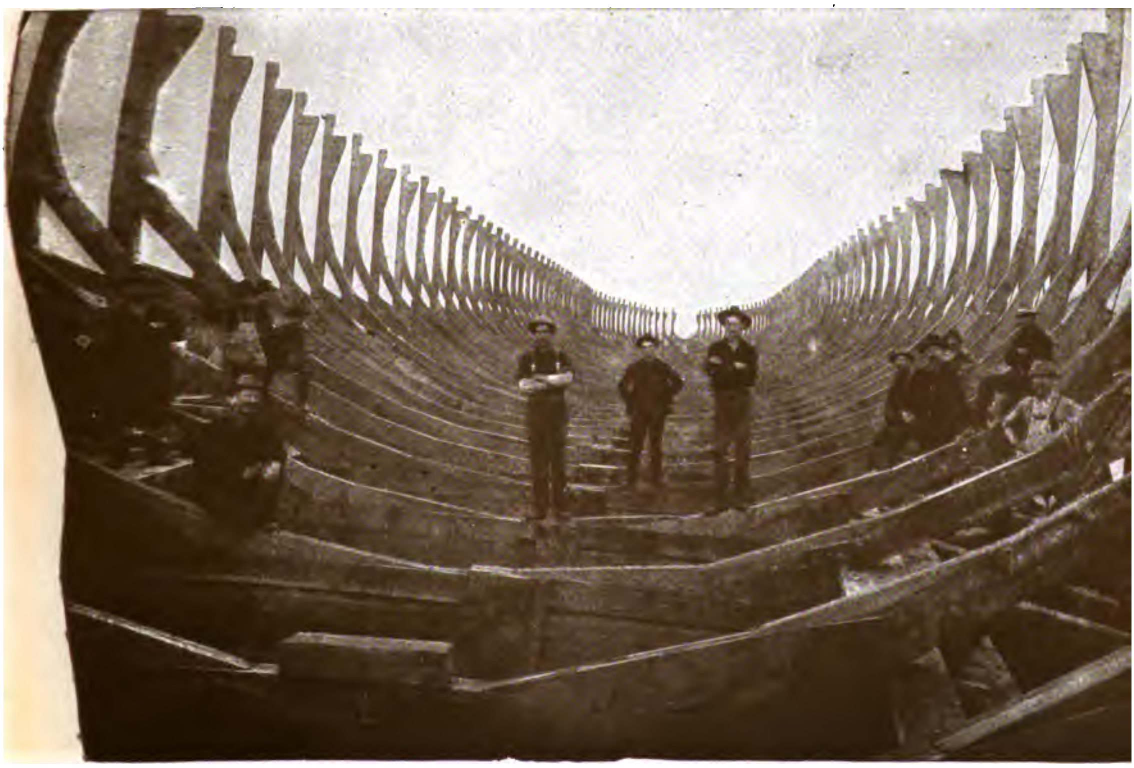
Lumber Industry in the United States, The. The history of the lumber industry of the United States began at the landing of the first colonists in Massachusetts, Virginia and Georgia. Loghouses sheltered the early settlers. Planks were split from logs and dressed by axes. At length pit sawing, a hand operation, became the initiative of the great saw-mill industry. As population increased and the demand for building material developed the inventive genius and energy of the people evolved the saw mill, which was run by water power. Subsequently came the steam mill. In the progress of events the evolution, starting from the old sash and muley mill, with a capacity of 6,000 to 10,000 feet a day, has attained to the modern one of 100,000 and even 350,000 feet capacity, in some notable instances. During the 283 years since the Pilgrims landed at Plymouth Rock the lumber industry of the United States and Canada has grown to a production of probably 1,000,000,000,000 feet, board measure. In but three States — Michigan, Wisconsin and Minnesota — according to best available statistics, the production of pine lumber from 1830 to 1897 amounted to 286,000,000,000 feet, to which can be added 75,000,000,000 of hard woods, making a grand total of 363,000,000,000 feet, the valuation of which has been computed at $5,250,000,000.

The early development of lumber manufacture of course occurred in that narrow fringe of Atlantic coast country first settled by emigrants from Europe. They found the entire country heavily wooded. White pine abounded in the New England States and pitch pine in Virginia, the Carolinas and Georgia. The most stupendous growth of the lumber industry has involved white or soft pine, since it abounded from Maine westward to beyond the Mississippi, in the States wherein the most rapid growth of population, settlement of new territory, the elaboration of internal improvements, and development of transportation facilities have occurred. In the early history of the country the people chose white pine for structural purposes because of its abundance and availability. Other woods were used, but the main supply of lumber was derived from pine. In New England and the Middle States, however, the industry was largely local, the lumber produced being mainly devoted to the erection of farm and village structures in the immediate vicinity of the mills, all of which were small. As such cities as Boston, New York and the lesser ones grew up along the coast a market for a large product was developed. There was also a demand for ship-building, and at length for shipment to the West Indies and other foreign parts. The coast trade began to be largely supplied from Maine, which came to be known as the Pine Tree State. Logs reached the mills by floatage down the rivers. It was in Maine that the white pine lumber industry became of great commercial importance, and the evolution of the saw-mill began. Along the Canadian border of Vermont and New York, likewise, there was notable development of the white pine business from about 1800 to 1830. Large quantities of pine were yearly cut and floated down Lake Champlain and the Sorel river into the Saint Lawrence, and thence to Quebec for shipment foreign.

About the time this pine was exhausted and that of Maine and New Hampshire was beginning to approach exhaustion the great West began to attract settlers. The opening up of the prairie States induced a demand for lumber, and the white pine industry of Michigan and Wisconsin naturally arose. It seems as if there was a divine purpose in planting the immense pine forests contiguous to the Great Lakes, which provided for transportation, and to the prairie country, which furnished a market for lumber and timber. By the influences of supply and demand the pine product of Michigan, Wisconsin and Minnesota rose to its maximum in 1890, when the total output was 8,597,623,000 feet. The earliest statistical record was made in 1873, when the total amounted to 3,993,780,000 feet. The totals did not materially vary until 1879, when the aggregate product swelled to 4,806,943,000 feet. The yearly output tended upward, with some annual depressions, until the highest mark



A GIANT RAFT ON THE COLUMBIA RIVER, BOUND FOR SAN FRANCISCO.



THE EMPTY "CRADLE" FOR BUILDING A GIANT RAFT ON THE COLUMBIA R
NEAR ASTORIA

was reached in 1890. A positive decline in total product was noticeable in 1894, and it was gradual, with some fluctuations, until 1902, when the total had dropped to 5,294,395,000 feet, figures which still represent an enormous amount of lumber. The development of the prairie States, the rapid increase in population and wealth, the building of thousands of miles of railroad and the magical growth of cities, including Chicago, all caused a demand for lumber of a rapidly swelling volume unprecedented in the history of the world. Hence we have a forest product swelling in two decades nearly 300 per cent and reaching a value in one year of at least $85,976,230.

The declension of the annual product of white pine and its consort, Norway pine, has been marked since 1896, and never again in one year can the production reach the total of 1890, or even of the later one in 1895, when the output was 7,050,669,235 feet. The pine supply of the lower peninsula of Michigan is verging toward exhaustion, that of the once prolific Menominee district in upper Michigan and Wisconsin is long past its zenith, the Wolf river district in Wisconsin turns out but a few million feet of logs annually, while the same is true of the Black River and other streams in that State. More than four fifths of the total product of the three States is now turned out from the western two thirds of Wisconsin and Minnesota. This territory produced 4,328,930,000 feet of a total for the three States named of 5,294,395,000 feet. The diminishment of the white and Norway pine supply of the North would have been an unmitigable calamity if compensation had not resulted from the growth within recent years of the yellow pine product of the South. This began to be manifest in the lumber trade of the Middle West early in the '80s of the last century. But before this, and beginning with the early settlement of the Atlantic coast colonies, the pitch pine of Virgina, North Carolina, South Carolina, Georgia and Florida held a relation in respect to consumption like white pine in the North. It entered into the local supply for building material, and as the cities grew and coastwise and foreign commerce increased, the pine of the southern coast was used for building of houses and ships, and was sent to foreign lands. In time the product of the mills was shipped by sea to New York, Baltimore, Philadelphia, Boston and other ports. For many years the flooring manufactured from Georgia pine has been a favorite in the northeastern States. The export of pitch pine, or yellow pine, timber from the southern coast has built up such important shipping points as Pensacola, Mobile, Fernandina, Jacksonville, Savannah, Wilmington and Norfolk. Yet it remained for a later time to develop a vast interior demand for the yellow pine of Georgia, Alabama, Mississippi, Louisiana, Arkansas and Texas. The promotion of this growth arose from the decline in the supply of northern pine already referred to, which was seen to be imminent early in 1900. Ten years before that efforts had been made in Mississippi, Arkansas and Texas to push yellow pine as a competitor in middle western markets, with varying success. More rapid progress was made from 1890 forward and still greater from 1901 to 1903. Lumbermen and capital from the old pine States of the North were attracted to the southern field, many new and modern mills were built, and railways were constructed for hauling logs from the forests to the mills. In the meantime the total northern pine supply in the three main producing States had declined from 8,597,623,000 feet in 1890 to 5,294,395,000 in 1902. This gave yellow pine opportunity to pass into the vacuum caused by the shrinkage of northern product. The longleaf pine of the gulf section, from Georgia to Texas, was admirably adapted to conversion into bridge, railroad and building timber, car sills and other parts of car building, as well as to flooring and interior finish. The shortleaf pine, while not so much in request for the heavier forms of construction, was much sought after for the lighter frames of buildings and all interior and exterior work. It was peculiarly adapted to enter into a various manufacture, especially of doors, sash, interior trim, etc. The remarkable development of Kansas, Nebraska, Indian Territory, Texas and Oklahoma has given an impetus to yellow pine manufacture and distribution in the southwest. At the same time Mexico has increasingly drawn upon the supply, and the South American, West Indian, South African and European demand is an important feature of the trade in localities convenient to Gulf and Atlantic ports. As the northern pine supply diminishes, the main lumber resource of the country east of the Missouri River will be the yellow pine of the South. Included in the whole will be the longleaf, shortleaf, loblolly, Cuban and North Carolina varieties. The United States census estimates from obtainable data that the yellow pine forests of the South cover approximately 150,000 square miles, or 100,000,000 acres. The average stand per acre is estimated at 3,000 feet, board measure, thus giving a total of 300,000,000,000 feet. The cut in the census year 1909 was made out to be 16,250,000,000 feet, or 6 per cent of the estimated stand. If the estimate of the total stand is approximately correct there was enough in 1909 to supply the annual cut, at the rate in that year, for 20 years, without allowing anything for growth in the interval.

Another factor within recent years has been thrust into the lumber supply of the United States; this is lumber from the Pacific coast States, with an appreciable quantity from Idaho, Montana, Arizona, New Mexico, Colorado and Wyoming. The prominent features of this far western supply are the fir, cedar, spruce and hemlock of Washington and Oregon, and the redwood, sugar and white pine of California. Fir and redwood are the leaders in Pacific coast lumber resources. Before the building of the transcontinental railways the consumptive demand of the Pacific States and the export trade were the only outlets for mill product. For many years after the Union Pacific, the Southern Pacific and the Northern Pacific railroads were opened to traffic west coast lumber made but little progress in the East. In the eighth decade of the last century attempts were made to introduce California redwood of high grade for interior finish and some special cabinet purposes, but high freight rates precluded much use of such lumber. Small amounts reached the Atlantic coast cities by sea. At about the same period, though somewhat later in the decade, fir timber from Washington was sent into the Middle West to be used where especially long and large pieces were required for special work. From these initiatives the trade in redwood and fir made slow and irregular progress until about 1900, when the declining supply of white pine and advancing prices therefor turned the attention of manufacturers of doors and sash to the consumption of California sugar pine and white pine in their industry. Idaho pine was also exploited in the same connection. Redwood also began to receive more attention in the country east of the Rocky Mountains. Increased energy was given to the pushing of Pacific Coast lumber of all sorts in the eastern and middle portions of the country by the capital and enterprise of lumbermen of the old pine States who had begun to operate in the newer fields on the Pacific coast.

The three Pacific coast States, Washington, Oregon and California, contain an estimated one-third of the standing timber of the country — about 660,000,000,000 feet for the three. The timber found in the greatest abundance in these States is fir, red, yellow and white, the last named forming a very small percentage of the whole. Red cedar is found in Washington and Oregon and white cedar in Oregon and California. The various species of the pine are found in eastern Washington, southern Oregon and northern and central California. The fir forests are intermixed with spruce, hemlock and cedar. The growth of the lumber industry on the Pacific coast has been very rapid during the last few years, due to the expansion of trade in the far eastern countries, the opening of the Philippines and a wider distribution abroad. The home consumption has increased steadily and has been a potent factor in the development. Shipments to eastern States have assumed larger proportions and will continue to grow as the forest resources of the older lumber-producing States become exhausted. Fir, which is used for almost every purpose where lumber is desired, and which makes a large percentage of the entire output, comprised nearly two thirds of the output in 1902, according to the statistics compiled by the 'American Lumberman,' the total being 2,238,962,000 of a grand total of 3,932,364,000 feet, which included the product of Nevada, Idaho and Montana. The remaining product was about evenly divided between spruce, cedar, redwood, sugar pine, white or yellow pine and other soft woods. About the same ratio held good in 1901. None of the Pacific coast States is a heavy producer when the standing timber is taken into consideration with that in the East. Washington, which has an outlet to the East by three railroads, is far in the lead. It also has unexcelled facilities for handling the export trade and the best natural harbors of the world. Oregon practically has only two lines of railroad and only two good harbors, so that the industry in that State has not kept pace with the growth in Washington, although Oregon has more timber than any other State in the Union. In making up the figures for the Pacific Coast, Idaho, Montana and Nevada were included. The report, which was very comprehensive although not entirely complete gave an output of fir of 2,238,962,000 feet in 1902; in 1901, when the report was not so comprehensive, the total was 1,424,097,000; spruce — 1902, 242,082,000; 1901, 149,499,000; cedar — 234,529,000 in 1902, 138,882,000 in 1901; redwood — 317,568,000 in 1902, 119,476,000 in 1901; sugar pine — 150,914,000 in 1902, 132,653,000 in 1901; other pine — 716,622,000 in 1902, 448,367,000 in 1901; other soft woods — 89,516,000 in 1902, 73,850,000 in 1901; hardwoods — 3,330,000 in 1902; 30,600,000 in 1901; shingles — 6,297,916,000 in 1902, 3,940,848,000 in 1901.

Comparing the figures compiled by the 'American Lumberman' with the census reports for 1900, a big increase is shown but not all the increase that was made, as the census figures are more complete owing to the facilities at the command of the government for gathering data. These totals compare as follows, the 1902 series of figures being those compiled by the 'American Lumberman' and the 1900 by the census bureau: California, 1902, 829,792,000; 1900, 734,232,000. Oregon, 1902, 915,848,000; 1900, 734,181,000. Washington, 1902, 1,886,087,000; 1900, 1,428,205,000. Fir is the great export timber of Oregon and Washington, and is also used in the manufacture of sash and doors, for car material and for general building purposes. The wants of the world where big timbers are required are pouring in upon the fir manufacturers to be filled. Some of the higher grades of stock are shipped east and large timbers are also going east for special structural work. Timbers have been cut as large as 24 x 24 inches, 120 feet long, but trees capable of producing such lumber are growing scarcer. Red cedar is used mainly for shingles, though of late years mill workers are turning their attention to it and making porch columns, doors, and similar products. The spruce is used as factory stock, for outside finish, moldings and box materials. There are very few paper factories on the west coast as yet. Hemlock is being used to some extent during the last two or three years. Sugar pine is coming into prominence in the East, where there is a good demand for high grade stock among the factories. The lower grades are used for boxes. The other pines are used for a variety of purposes.

Among the problems confronting the manufacturers at the present time is the difficulty in disposing of the lower grades to advantage. Methods of manufacture are getting closer year by year, but there is still a considerable part of the stock wasted, as there is now no avenue through which it can be marketed to advantage. The other pines are used for general building purposes and to a certain extent in the manufacture of boxes. The redwood lumber industry is separate and distinct from the others. Accurate records have been kept from year to year of the output of the mills. The shipments from the mills increased nearly 70 per cent from 1894 to 1902, the figures being 157,544,080 feet in 1894 and 262,597,015 feet in 1902. This year the shipments from the mills will aggregate perhaps 300,000,000 feet. All of the Pacific coast timber country is rough and broken, necessitating expensive methods of logging. In the fir and redwood districts all logging is done by steam, donkey engines being used to drag the logs from where the trees fall to the logging railroad. In the pine districts high wheels are used as a general rule, although the donkey engines are employed to a certain extent. The lumbermen of the Pacific coast have hardly begun their onslaught on the timber. The wood is already being used in appreciable measure to replace the decreased product of the old Northwest and is coming into competition with the yellow pine of the South. The coast States are the coming giants of the lumber trade. The output has been increasing very fast and it would seem as though it was getting ahead of the demand or that it was growing faster than the markets. This is especially true of the cedar shingle industry, in which the great increase in the production caused values to depreciate in 1903.

The most plebeian of all American lumber woods is hemlock. It is a coarse-grained wood, much given to unsound knots and shape. Its growth is scattered from the north Atlantic coast to Minnesota; it is mostly found among the hardwood growths of the uplands, but sometimes standing in groups and groves on the lower levels bordering swamps. Hemlock is a cheap kind of lumber. It has been used from the earliest days of the republic by the farmers and villagers of the northern tier of States, Pennsylvania and West Virginia, for the building of houses and barns. Within a few years it has been exploited in the lumber trade of Michigan and Wisconsin as a supplement to the diminishing supplies of white and Norway pine. It is distributed in the Middle States and the northerly belt of the Middle Western States, being largely used for framing dimension, and coarse boards, shingles and lath. The total output of hemlock lumber for the United States in 1899 was 3,420,673,000 feet.

Spruce from an early period has furnished the northeastern States a large aggregate of structural and manufacturing material. It is a coniferous wood, grows with a lofty, smooth body, of moderate diameter. It abounds in Maine, New Hampshire, Vermont, northern New York in large commercial quantity, and stands in considerable amount in upper Michigan, northern Wisconsin, northern Minnesota, also in the Appalachian range in the South. Industrially and commercially considered, spruce has occupied an important position in the lumber trade of the East. Maine has been the most prolific source of supply. Though spruce holdings in that State have been much reduced within recent years the annual cut is still considerable. The Adirondack region of northern New York is next to Maine in magnitude of spruce production. Spruce furnishes a large part of framing dimension used in Boston, New York, and other coast cities, and the districts contiguous to those centres. Spruce also enters into other forms of building material and also factory product. It is highly esteemed for siding of clapboards throughout New England. Spruce is also the main dependence in the manufacture of paper pulp, and a great industry has been developed in getting out pulp wood. In the old pine states of the Northwest the rather limited growth of spruce is being utilized for lumber and pulp wood. Pacific coast spruce is elsewhere treated of in this article.

White cedar, another conifer, is prevalent in all the New England and Middle States, and those touching the Great Lakes. It is used for railroad ties, telegraph and telephone poles and fence posts. Shingles also are comprised in white cedar products. The annual output is large, but no statistics of it have ever been gathered.

Cypress is a tree growth of the damper alluvial bottoms of the South and the Ohio River Valley. It makes a sizable growth and turns out a large percentage of clear lumber. The wood is comparatively soft and easily worked, and as a shop lumber and one adapted to interior building purposes, as well as for siding, porch work and shingles, is taking the place of white pine. The same can also be said in reference to tank making, and it is much devoted to car building. The strongest present factor in the cypress trade is the red cypress produced in Louisiana. The most copious supply comes from the mills of that State and enters into the lumber trade of the Middle West, the Southwest and the East. Cypress is also in vogue among consumers in all the Gulf coast cities. A large amount of cypress is produced in the Carolinas and Florida, Georgia, Alabama, Mississippi and Arkansas.

The hardwoods of the United States in the early history of the country were much less prized than the coniferous timbers, especially the pines. This was because in the settlement of the country the soft woods were more available than the hard for structural purposes. They were abundant, were easily cut and handled and were light enough to float in the streams and lakes, then the only means of transportation. The live oak of the south Atlantic coast and the white oak of the North were from an early date used for ship-building and any purpose where great strength and durability were requisites. Oak, cherry, maple and birch were also employed for the making of furniture. In the latter use, however, mahogany entered into the making of furniture for the rich throughout the earlier and middle portions of our history. When the railroad era came in, the great interior of the northern States was opened up, population expanded and numerically increased, and the utility of and demand for the hardwoods began to be developed. Western New York, Ohio, Indiana, Michigan, southern Illinois and the valleys of the southern rivers abounded with abundant growths of fine oak of several varieties, ash, black walnut, yellow poplar, hickory, sycamore, gum and other useful woods. New England, New York, Michigan, northern Wisconsin and northern Minnesota were included in the zone where maple, beech, elm, birch, black and white ash and other available woods abounded.

Commercially considered, the great leader among American hardwoods is oak in its several varieties; paramount among the varieties is white oak. In trade and the industries white oak ranks relatively with white pine, and for cabinet purposes is a near approach to mahogany. No other wood enters into so wide a range of uses as white oak. It is employed as timber and planking in ships, in the construction of canal locks, bridges, railroads, cars, vehicles of all kinds, agricultural machinery, tools, cooperage etc., outside of interior finish and furniture manufacture. In respect to the last two named uses white oak has taken first place in the common application, though red oak is largely employed. In the very finest finish and furniture mahogany only ranks above white oak. The growth of the hardwood lumber trade was accelerated after railroads began to penetrate the western States, beginning with about 1845, the mileage extending rapidly after 1850. For many years thereafter the oak and ash supply was largely drawn from the States north of the Ohio River, but considerably from Kentucky and Tennessee. Along in 1880 hardwood lumbermen began to invade the rich hardwood regions of the lower Mississippi and tributaries, lying along the river bottoms in Missouri, Arkansas, Mississippi and Louisiana. The hardwood industry of these States has in latter time grown to immense proportions, though the output of oak in either Indiana or Ohio up to 1900 continued to exceed that of any of the Southern States.

The total production of oak in 1900 was 4,438,027,000 feet, the total valuation having been $61,174,120 on a basis of $13.78 a thousand. During the past 25 years there has been a remarkable increase in the use of both white and red oak in finishing the interior of buildings and the making of furniture. In the earlier history of the country, pine was mostly employed in the interior work of all but first rate structures throughout the country from the eastern seaboard westward. But in the recent period of rapid accumulation of wealth and the growth of artistic and luxurious tastes, soft woods for interiors have largely been discarded, and oak has been substituted as the most available for medium class structures, and to a large extent the better class when mahogany and other tropical woods were not utilized. This copious use of oak has promoted a great industry and a trade which is not only domestic in prevalence but extends to Europe and other foreign countries. Quarter sawing is a special feature in the treatment of both white and red oak, that kind of manufacture being especially chosen for the finer finish and furniture. Red oak has long been the favorite in both plain and quarter-sawed treatment among home finishers and furniture manufacturers, because of its softness and easiness of working and its bright and conspicuous figure when plain sawed lumber is finished. Next to oak, ash leads in the manufacture of agricultural machines and implements, boat oars and various other manufactures. White ash is the strongest variety, but black ash is largely used in cooperage, bent work, some cabinet work and house finish. The available quantity of ash of both varieties is rapidly diminishing.

As late as 1880 to 1884 black walnut was the most conspicuous furniture wood in the United States, and also much employed for interior finish. It not only was a favorite in this country but in Europe as well. Its most abundant supply was in the States of the Ohio River watershed, Indiana probably leading in the total production. It is a regal wood, though it has passed to the rear in demand, partly because of its diminishing supply and partly because the public taste at length revolted at its sombre hue. Yet walnut stands preeminent as a cabinet wood in some particulars. There are its softness under the operation of tools, its satiny appearance when finished, its durability under hard treatment, and its dignity as compared to other woods either in furniture or finish. Though the supply of black walnut has so far diminished as to place it among the minor kinds of American lumber, it is still present in considerable quantity. Indiana, Ohio, Missouri, Tennessee, Iowa and Kentucky still furnish the market with walnut, the total from the last census having been 38,636,000 feet. Of this total Indiana is credited with 10,637,000 feet, Ohio coming next with 6,857,000 feet and Missouri third with 6,285,000 feet. The larger portion of the black walnut now produced is shipped to foreign countries, Germany and France probably being the larger purchasers.

Maple, elm of the soft and hard varieties, birch, cherry, chestnut, sycamore and beech are all used for furniture making, for house trim, and various other things. At one time cherry was an important furniture wood, but the supply is so nearly exhausted that it commands less attention than formerly. Chestnut is much devoted to coffin making, and sycamore is employed when a rarity in figure is wanted in interior finish or furniture. Both are minor woods in the trade. Hickory has always been a favorite in the construction of vehicles, on account of its toughness and elasticity. The available quantity is never in excess of demand.

Basswood is classed among the hardwoods commercially speaking, because it is a deciduous growth. Its texture is, however, softer than that of some of the coniferous woods. Basswood abounds in the northern forests, and to a degree in the South, but its most natural habitat is in the maple and beech zone. It has entered largely into the lumber industry, being especially prized by the furniture makers, used to some extent in exterior and interior building, and is highly prized in all work where a white, easily worked and sometimes elastic wood is required. The forest growth is being rapidly exhausted in Michigan and Wisconsin, which States have harbored the most abundant tracts within recent years.

Among the hardwoods gum, or satin walnut, as it is called in Europe, has recently risen in importance. It abounds in the Ohio and lower Mississippi valleys and wherever river bottoms are found all over the South. It is a hard, compact wood of involved grain, but is of large growth, comparatively free of knots, and is being made adaptable to various uses. The two main varieties are red gum and tupelo. The red variety, so called from the color of the heart wood, is preferred by the mill operators and consumers. A few years ago gum was a rejected kind of lumber, because the saw-mill operators and handlers were ignorant or regardless of the best methods of treating it so as to prevent its tendency to warp. But the demand within recent years has so increased that manufacturers have been urged to the discovery and practice of improved methods, with the result that gum is now successfully treated and has become an important factor in demand. Since there is a vast growth of gum on southern river bottoms a great enlargement of product is inevitable.

Cottonwood in recent years has come to the front as a kind of lumber adapted to box manufacture, wagon box boards, backing for furniture and other purposes where cheap and workable lumber is requisite. The supply is mainly confined to the bottom lands of the lower Mississippi, and at the rate it is being cut out will not last many years.

As an all-purpose wood poplar is perhaps as adaptable as any that is converted into lumber. Reference is here made to the poplar of Kentucky, Tennessee, West Virginia, Indiana, Ohio and southern Michigan. The wood is called the tulip, and in northern Indiana and southern Michigan whitewood. It should not be confounded with the aspen poplar of the North and Canada. Poplar or tulip, the commercial wood here treated, attains a large growth. Poplar lumber is devoted to a great variety of uses. Owing to the size of the logs the average of the lumber is wide, and therefore is adapted to work that demands such lumber. It is of tough fibre, though easily worked, and adapted to re-sawing and bent work. It is much used for carriage bodies, coffins, wagon boxes, furniture, stained finish, packing boxes, porch columns, agricultural machines, billiard tables, siding and casings for houses, door and sash making, and a multitude of applications that cannot be mentioned here. In fact there is little wood work to which poplar cannot be made to apply. For this reason the domestic and foreign demand for poplar has always readily absorbed the supply, but it is constantly brought into sharp competition with other woods. See FORESTRY IN THE UNITED STATES; WOOD-WORKING MACHINERY.

J. E. DEFEBAUGH,
Editor of the 'American Lumberman.'

Lumber State, a popular designation for the State of Maine; because of the large forests and the great number of its people engaged in lumbering.

Luminais, Evariste Vital, ĕv-ā-rĕst vē-tāl lü-mē-nā, French painter: b. Nantes 14 Dec. 1822. He studied with Léon Cogniet and Troyon, received a third-class medal at the Paris exposition of 1855, and one of the first class at that of 1889. His works are largely genre and historical studies from Gallic legends and early French annals, and his manner is spacious and full of vigor.

Luminif'erous Ether. See ETHER.

Lum'inous Paint, a paint containing phosphorus, which after exposure to strong light becomes luminous in the dark for a time. It is used for street signs, buoys, clock dials, etc. See also PAINT, PHOSPHORESCENCE.

Lum'mis, Charles Fletcher, American author: b. Lynn, Mass., 1 March 1859. He was graduated from Harvard in 1881, went to Los Angeles, Cal., there was an editor of the *Daily Times* (1885–7), and later became editor of the monthly 'Out West.' He spent five years among the Pueblo Indians of New Mexico, studying their speech and customs. Among his writings are: 'A Tramp across the Continent' (1892); 'The Land of Poco Tiempo' (1893); 'The King of the Broncos' (1897); 'The Enchanted Burro' (1897); 'The Awakening of a Nation' (1898), and the collection, 'The Man who Married the Moon, and other Pueblo Indian Folk-Stories' (1894).

Lump'kin, John Henry, American jurist: b. Oglethorpe County, Ga., 13 June 1812; d. Rome, Ga., 6 June 1860. He studied at Franklin College of the University of Georgia and at Yale; after a course in law was admitted to the bar in March 1834, entered practice at Rome, Floyd County, Ga., was a member of the Georgia house of representatives in 1835, and was solicitor-general of the Cherokee circuit in 1839–42. As a Democrat he sat in the United States Congress in 1843–9 and 1855–7; and in 1849–52 he was judge of the Cherokee circuit court. In 1857 he was Democratic candidate for governor of Georgia, but was defeated. In 1860 he was a delegate to the State Democratic convention (June) and to the Democratic national convention held at Charleston, S. C., and Richmond, Va. (23 April; 21 June).

Lumpkin, Joseph Henry, American jurist: b. Oglethorpe County Ga., 23 Dec. 1799; d. Athens, Ga., 4 June 1867. He was a brother of Wilson Lumpkin (q.v.). He was graduated from the College of New Jersey (now Princeton) in 1819, studied law in the office of Judge Cobb at Athens, was admitted to practice in October 1820, and practised at Lexington, Ga., until 1844. In 1824 and 1825 he represented Oglethorpe County in the State legislature of Georgia, and from 1845 was chief justice of the Georgia supreme court. He was one of the chief organizers of the Lumpkin law school of the University of Georgia, and occupied the chair of law in the school in 1859–61. He resumed the professorship in 1865, and retained it until his death. In 1833 he assisted in the compilation of the penal code of Georgia. Both as an advocate in criminal cases and as a judge he is described as exceedingly able. For many years he was prominent in the temperance movement.

Lumpkin, Samuel, American jurist: b. near Lexington, Oglethorpe County, Ga., 12 Dec. 1848; d. Washington, Wilkes County, Ga., 18 July 1903. He was graduated from the University of Georgia in 1866, was admitted to the bar in 1868, was solicitor-general of the northern Georgia circuit in 1872–6, and State senator in 1878–80. In 1885–90 he was judge of the superior court of the northern circuit, on 1 Jan. 1891 became associate justice of the supreme court of Georgia, and on 4 Jan. 1897 presiding justice of the 2d division of that court.

Lumpkin, Wilson, American politician: b. Pittsylvania County, Va., 14 Jan. 1783; d. Athens, Ga., 28 Dec. 1870. He was a brother of Joseph Henry Lumpkin (q.v.). He removed to Oglethorpe County, Ga., in 1784; in 1797 was made a copyist in the superior court of Oglethorpe County; was admitted to the bar; and practised at Athens, Ga. He was elected several times to the lower house of the Georgia legislature, and also served in the State senate. In Congress he sat as a representative from Georgia in 1815–7 and 1827–31. In 1831–5 he was governor of Georgia (two terms). During his administration the Cherokees were deported across the Chattahoochee, and the region previously occupied by them was subdivided into thirteen counties, the county and town (in Stewart County) of Lumpkin being named in his honor. From 13 Dec. 1837 to 3 March 1841 he was United States senator to fill a vacancy. In 1823 he was appointed by President Monroe to determine and map the boundary line between Georgia and Florida; and he was also a member of the first State board of public works, appointed by the legislature. As State surveyor he laid out most of the lines of early Georgia railways.

Lumpkin, Tony, in Goldsmith's comedy 'She Stoops to Conquer,' a rude country squire, the son of Mrs. Hardcastle by her first marriage. He is ignorant and boisterous, and clownishly conceited, and the humor of his practical joking bears the stamp of his innate viciousness.

Lump'sucker, an extraordinary marine fish (*Cyclopterus lumpus*), of oval, ugly form and allied to the sea-snails (*Liparis*) and gobies. It is remarkable for the brilliant red and purple colors which the male puts on in the breeding season in the spring, when it approaches rocky shores on both sides of the northern Atlantic to deposit its spawn. This fish has the short ventral fins so united as to form a sucking disk by which it attaches itself to the bottom and holds on against waves and currents, while it preys upon small fishes, crustaceans, etc. It is well known and eaten in Scotland under the name «cockpaidle.»

Lumpy Jaw. See Actinomycosis.

Luna, Antonio, ăn-tō'nē-ō loo'nä, Filipino insurgent politician: b. Manila, Philippine Islands, about 1854; d. Luzon Island, Philippines, 8 June 1899. He was educated largely in Paris, returned from Europe to Manila early in 1898, and became the editor of 'La Independencia,' organ of the insurgent party. Upon the formation of a so-called government by Emilio Aguinaldo in December 1898, the latter placed Luna at the head of the war department. Shortly afterward Luna was removed from this post and made the immediate commander of Aguinaldo's forces with general's rank. Difficulties arose between himself and Aguinaldo; and the latter, fearing, it was said, an attack upon his life by Luna, ordered the guards to kill anyone regardless of rank who might attempt to enter the headquarters. Upon Luna's appearance and demand for an interview, he was accordingly shot.

Luna, Pedro de, pā'drō dā, antipope: b. Spain 1334; d. Peñiscola, Valencia, 1424. He was sprung from a noble family of Aragon, and, after entering the priesthood, became distinguished as a canonist, and was appointed professor in the university of Montpellier. He received a cardinal's hat in 1375 and was elected to Avignon as antipope in 1394. The conclave of cardinals annexed as a condition to his election, that he should resign if ever an opportunity occurred when, by so doing, he could put a stop to the schism. This he refused to do although he was deposed by the council of Pisa (1409), and by that of Constance (1417). Banished from Avignon, he retired to the fortress of Peñiscola, near Valencia; where he spent the rest of his life in excommunication.

Luna, lū'nạ (the moon), among the Greeks *Selēnē*. Her worship is said to have been introduced among the Romans in the time of Romulus. She had a temple on the Aventine, one on the Capitol, a third on the Palatine.

Luna Moth, one of the largest and most beautiful of the great American silkworm moths, *Tropæa luna*. Its general color is delicate green, there is a purple brown band along the front edge of the fore wings, and a pair of richly colored ocelli upon each of both pairs of wings, the hinder pair of which terminate in long curving «tails.» The caterpillar grows to a length of about three inches, and is pale bluish green with a pearl-colored head; it has a pale yellow stripe along each side of the body, and a transverse yellow line on the back between each two abdominal segments. It feeds upon leaves of forest trees, as the hickory, walnut, etc. The cocoon is formed of a very thin, leaf-like material with little silk, and is usually found upon the ground.

Lu'nacy, Lunatic, etc. See Insanity.

Lunalilo, loo-nä-lē'lō, **William C.,** king of the Hawaiian Islands (1873-4): b. 1835; d. 3 Feb. 1874. He received a good education, and was liberal in his political views. His health failed soon after his ascending the throne, and he paid inadequate attention to administrative business.

Lu'nar Caustic. See Nitrate of Silver.

Lunar Tables, in astronomy, ponderous volumes of solid figures which are the numerical development and tabulation of the analytical theory of the moon's motions and perturbations. See Moon.

Lunar Theory, The, in astronomy, the deduction of the moon's motion from the law of gravitation. See Moon.

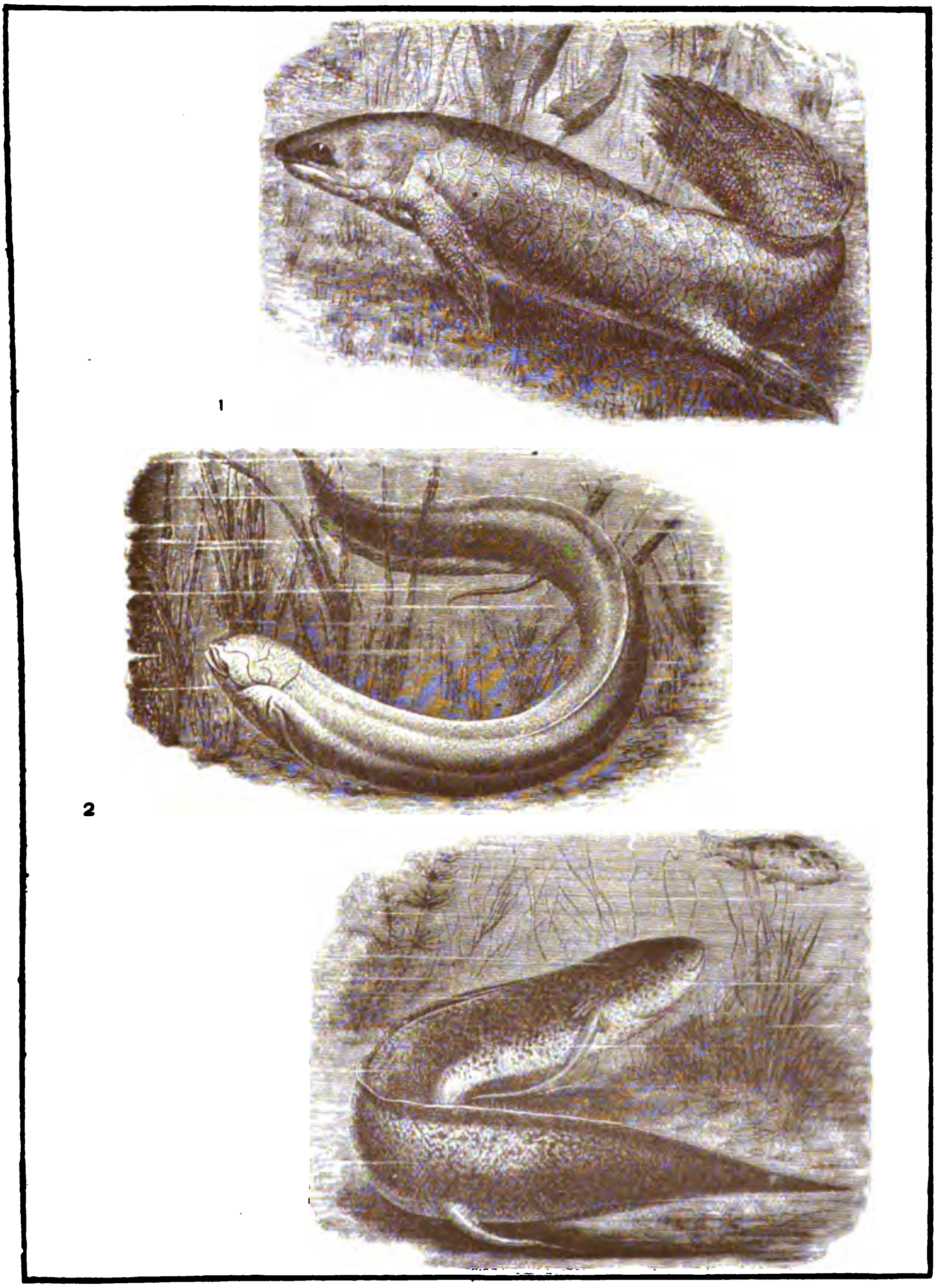
Lunar Year. See Year.

Lund, loond, **Peter William,** Danish naturalist: b. Copenhagen, Denmark, 14 June 1801; d. Lagôa Santa, Minas Geraes, Brazil, 5 May 1880. He traveled in Brazil 1827-30 and was sent there on a Russian scientific expedition in 1831. Three years later he established himself at Lagôa Santa, where he passed the rest of his life in exploring the limestone caves of the region and studying the fossils contained in them, discovering several hundred species in the course of his investigations.

Lund, Sweden, town, in the län of Malmöhus, on an extensive plain, about eight miles from the Sound and 24 miles east of Copenhagen. It is a very ancient place, and was once surrounded with wooden fortifications, and had its warehouses filled with the merchandise and treasures. In the Middle Ages the Scandinavian monarchs were elected kings of Scania on a hill in the immediate vicinity. The present town occupies a large extent of space, and is very irregularly built. It has an ancient Romanesque cathedral, one of the finest churches in Sweden (recently restored); a university attended by 700 students, and occupying buildings erected in 1878-82, while the old building contains the library (180,000 volumes), historical museum, etc. With the university are connected a zoological museum and a botanic garden. The town boasts of a statue of Tegnér, and the house in which he lived. Glovemaking and iron-founding are among the industries, and there is a trade in agricultural produce.

Lun'dy, Benjamin, American abolitionist: b. Hardwick, Sussex County, N. J., 4 Jan. 1789; d. Lowell, La Salle County, Ill., 22 Aug. 1839. His parents were members of the Society of Friends. At 19 he removed to Wheeling, Va., where he labored as an apprentice to a saddler. At this place his attention was first directed to the subject of slavery. He subsequently settled in business in St. Clairsville, Va., where in 1815 he originated an anti-slavery association, called the «Union Humane Society.» Soon after a journal entitled «The Philanthropist» was commenced at Mount Pleasant, Ohio, to which Lundy contributed. He then visited St. Louis, where he remained nearly two years engaged in a newspaper exposition of the slavery question. At Mount Pleasant, he commenced, in 1821, the publication of the 'Genius of Universal Emancipation,' the office of which was removed to Baltimore in 1824. In 1825 he visited Hayti to make arrangements for the settlement of emancipated slaves. In 1828 he visited the eastern States, where he formed the acquaintance of a number of prominent abolitionists, one of whom, William Lloyd Garrison, afterward became associated with him in editing his journal. In 1830-1 he traveled in Canada and Texas to obtain subscribers to his paper, and to continue his observations on the condition of the slaves. He continued his literary connection with the

LUNG-FISHES.



1. Australian Lung-fish, or Barramunda. 2. Amazonian Mud-fish, or Lepidosiren.
3. African Mud-fish, or Protopterus.

'Genius of Universal Emancipation' as long as it was published, and was the first to establish anti-slavery periodicals and the delivery of anti-slavery lectures, and probably the first to introduce the formation of societies for the encouragement of the produce of free labor. Consult Earle, 'The Life, Travels, and Opinions of Benjamin Lundy' (1847).

Lundy's Lane, Battle of, also called the Battle of Niagara, or Battle of Bridgewater. This was a severe engagement fought on Canadian soil near Niagara Falls, 23 July 1814, between the British and American forces. Two days after the defeat of the British under Gen. Riall at Chippewa by Brig.-Gen. Scott 5 July 1814, the American forces under Gen. Brown, numbering about 3,000 men, crossed the Chippewa River and took post at Queenstown; Riall, after throwing a portion of his force into Fort George, retreating to a strong position near the head of Lake Ontario. Occasional skirmishes took place between the outposts of both armies; but Brown, finding that he had no battering cannon to besiege Fort George, and being unwilling to leave that fortress in his rear, fell back after a few days to the Chippewa. Here on the 25th he received intelligence that Gen. Drummond, who had reached Fort George with British reinforcements, had crossed the Niagara River at Queenstown to attack Fort Schlosser, where the American supplies were deposited. Scott was at once detached with 1,200 men to make a demonstration at Queenstown, and about sunset unexpectedly came up with Riall and his whole force at the head of Lundy's Lane. The small American force received the full fire of the British infantry, and held their ground until the arrival of the main body of the American army. Fighting continued during the night. Scarcely an officer remained unwounded in the American ranks, and the men, faint with their exertions and tormented by thirst, were ready to sink with exhaustion. Unwilling, however, to relinquish the field, they replenished their ammunition from the cartridge boxes of their fallen comrades and foes, who covered the ground around the battery, and then calmly awaited the assault of the British. After an hour's pause the latter, reinforced by fresh troops from Fort George, advanced under Gen. Drummond to the last assault. The conflict which ensued was more deadly than ever. At length the enemy, broken, and foiled at all points, retired. Brown and Scott being now disabled by wounds, the command devolved upon Colonel Ripley, who, finding the enemy indisposed to renew the attack, drew off his troops to the camp. In this battle, the most obstinately contested perhaps ever fought upon the American continent, the British force, beside greatly outnumbering their opponents, had the advantages of position and preparation. Against these odds the troops of Brown fought with a valor and obstinacy unparalleled in the war, and which did much to disabuse the country of the idea, then prevalent, that American troops could not cope with the trained veterans of Europe. According to the official accounts, the Americans lost in killed and wounded 743 men, and the British 878. Ripley, finding his forces reduced to less than 2,000 effective men, retired to the neighborhood of Fort Erie, having first destroyed the bridge over the Chippewa and a portion of his stores.

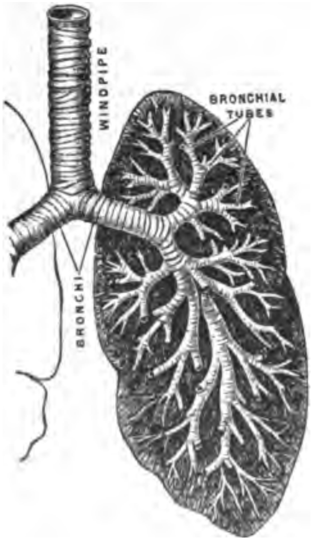
Lunenburg, loo'nĕn-bĕrg, Canada, town, seaport, capital of Lunenburg County, in the province of Nova Scotia; and about 35 miles southwest of Halifax. The first settlement was made by Germans, in 1753. It has a large, safe harbor. The chief industries are ship-building and fishing. Lunenburg has a large fishing-fleet engaged in the cod and other fisheries, and it exports considerable fish and lumber to the West Indies.

Lung'fish, a fish of the group *Dipnoi* (q.v.), few existing species of which remain. These are mostly sluggish fishes of tropical fresh waters, whose respiratory organs are lung-like. See BARRAMUNDA; CERATODUS; LEPIDOSIREN; and ICHTHYOLOGY.

Lun'gren, Fernand Harvey, American painter and illustrator: b. Maryland 13 Nov. 1859. He was educated at Maryland University, but before he could graduate he launched into the career of an artist with marvellous success, and became a favorite illustrator for some of the leading New York monthlies. He has paid great attention to night effects in city streets, but since 1891 has made an exhaustive study of the life, religion and folklore of the Indians of the Southwest, having had special opportunities as priest of the Snake-Antelope fraternity. His most notable pictures are: 'Thirst'; 'The Snake Dance'; 'Night in the Desert'; and 'A Ford on the Rio Grande.'

Lungs, the principal organs of respiration in air-breathing vertebrates. They are enclosed in the chest, an air-tight chamber which, mainly by means of the diaphragm (q.v.), acts as a bellows and moves in and out of them. There are two lungs, one on the left, the other on the right side of the chest, and between them are situated the heart and the great blood-vessels springing from it, the œsophagus, the thoracic duct, etc. The left lung is the smaller of the two, and both consist of a mass of ramified tubes, branches of the trachea, which unite them. Through the walls of the lungs all the blood of the body passes, receiving oxygen and throwing off carbonic acid. The simplest lung imaginable would be an elastic membranous bag, well supplied with blood-vessels, and with a pipe connecting it with the air; the most complicated lungs that exist are essentially of that construction, the purpose of the complications being merely the enlarging of the surface exposed to the air.

In all air-breathing vertebrates, the atmospheric air reaches the larynx through the nasal and the buccal cavities, then passes into the trachea, and into its ramifications which are called bronchi or bronchial tubes, and from these tubes into membranous pouches named alveoli. The terminal twig of a bronchial tube is a small canal, in which are found many openings or orifices of very short tubes, which are the ultimate ramifications of the tube. The lung-substance is composed of the alveoli, the air-sacs, the small bronchi, blood and lymphatic vessels, and nerves; the whole enclosed in a membrane that surrounds each of the lungs and is known as the pleura. The trachea or windpipe extends from the lower part of the larynx, of which it is the continuation, to the middle of the thorax, where it divides into the two large bronchi. It is situated in the middle line of the body, in front of the last cervical and the first five or six dorsal vertebræ. In the back part of the trachea there are transversal muscular fibres of the unstriped variety. The fibrous tissue found in the trachea belongs to the two varieties of yellow elastic and white fibres. The mucous membrane is thin and in perfect continuity with that of the larynx and that of the bronchi. Its most remarkable feature is that its epithelial covering is composed of ciliated cells having in high degree the vibratile movement. All along the trachea there are many mucous glands, and these are especially numerous upon its back part. The cilia lash upward, and thus keep the passages free from mucus and remove foreign particles. As the passages become smaller they lose their cartilages, and the muscles form a continuous circular layer. The length of the trachea is from four to five inches. The average transversal diameter of this tube is between nine and twelve lines in adults. The anterior two thirds of the trachea is cylindrical, the posterior third is a flattened wall. In the neck the trachea is covered by the skin and a few flat muscles; in the chest it is placed between the two lungs and covered by muscles, lymphatic glands, and the bony and cutaneous walls of the thorax. The structure of the trachea is complicated. This tube is essentially composed of an internal layer which is a mucous membrane and an external one which is fibrous. Imbedded in these membranes are from 16 to 20 cartilaginous pieces, with the shape of a horseshoe, or of a ring one third of which is missing. These incomplete rings are placed transversely at nearly equal distances one from the other; they give to the anterior two thirds of the trachea the cylindrical form.



The essential parts of the lungs are the air-cells or air-sacs, in which the function of respiration is performed. They consist of somewhat elongated cavities, which communicate with a bronchial ramification by a circular opening, usually smaller than the cavity of the cell. The air-cells are arranged in groups and separated from each other by thin walls. Many small, shallow, cup-like depressions, separated from each other by portions of membrane, are found at the bottom and on the lateral walls of the air-sacs. These, the alveoli, have no communication with each other except by their opening in the cavity of the air-sac. An epithelial layer exists in the air-cells and the alveoli. The walls of the air-cells are formed of a thin membrane in which the blood and lymph-capillaries ramify. Minute openings lead from the air-cells into the lymph-spaces of the membrane. The membranous walls are partly formed of elastic tissue. It is this that gives to the lungs their elasticity. At the root of the lungs the membrane known as the visceral pleura is continuous with a membrane which lines the chest-cavity (the parietal pleura). The space between the two is the pleural cavity; it is in reality a large lymph-space, and communicates with the lymphatics of the pleura. Owing to the air-pressure within the lungs, the two pleuræ are closely pressed together, the lungs entirely filling the chest-cavity.

The lungs are united with the heart and with the trachea by a part called the root, which, in each side, is composed of the large bronchus, a branch of the pulmonary artery, two pulmonary veins, and smaller vessels and nerves, the whole being almost completely covered by the pleura. Each lung is divided into lobes, two in number in the left one and three in the other. Each lobe is divided into lobules, which are arranged on the bronchial tubes like grapes on a bunch. Each lobule is surrounded by condensed areolar tissue mixed up with yellow elastic tissue. Each lobule is a fair representation, on a small scale, of a whole lung, as it hangs upon a bronchial tube, a branch of the pulmonary artery, branches of bronchial vessels, and nerves. In the roots of the lungs the two large bronchi divide, the right into three, and the left into two bronchial tubes, one for each of the pulmonary lobes. The primary bronchial tubes are very short, and divide into two or three smaller tubes, each of which gives off two or three divisions. Before reaching their termination, the tubes branch off four or five times more.

The weight of the lungs varies much according to age and sex. In adult men the two lungs weigh from 40 to 50 ounces, and in women from 28 to 35 ounces. The ratio of the weight of the lungs to that of the body is as 1 to 30 or 40. The specific gravity of the lungs is very slight, and, unless the air has been expelled from the cavities of the bronchial tubes and of the alveoli, any part of the lungs dipped into water will rise and float.

As respiratory organs the lungs bear a certain average relation to the physical proportions and condition of the individual. The average amount of air in the case of an individual 5 feet 8 inches in height that goes in and out of the lungs at each inspiration and expiration is about 20 cubic inches; this is called the tidal air. By means of forced inspiratory movements the ingoing tide may be increased by 120 cubic inches; by means of a forced expiration the outgoing tidal air may be increased by 90 cubic inches. After the most forced expiration possible there always remain within the lungs about 90 cubic inches of air. So that if a person takes as deep a breath as possible, and then makes as forced an expiration as he can, he will drive out 120 + 20 + 90 = 230 cubic inches of air. This is termed the respiratory capacity. Since the tidal air is only 20 cubic inches, and 180 cubic inches remain in the chest after an ordinary expiration, it follows the air directly changed during respiration is not that really within the lungs themselves, but is that within the nose, windpipe, and larger bronchi, the pipes that result from the branching of the windpipe. Therefore the changes of the air within the essential parts of the lungs are the result of diffusion between it and the purer air of the bronchi, aided by the rush with which the tidal air flows in.

The ordinary respiratory movements differ in the two sexes and at different periods of life. In young children the chest is altered in size chiefly by the movements of the diaphragm, and the protrusion of the abdominal wall during inspiration is therefore very marked. In men also it is the diaphragm which is chiefly operative, but the ribs are also moved. In women it is the movement of the ribs, especially the upper ones, which is the most extensive. The respiratory rhythm is the relation of the acts of inspiration and expiration to each other as regards time. See ANATOMY; BREATHING AND HEALTH; CIRCULATION; LUNGS, DISEASES OF; RESPIRATION.

Lungs, Diseases of. The disorders to which the lungs of man are subject form a long list of maladies, involving numerous complications. Of these the more important will be considered here.

Congestion of the Lungs.—Pulmonary congestion (hyperæmia) may be active or passive. In the majority of cases active congestion is a symptom or a condition associated with bronchitis, pleurisy, pneumonia, or tuberculosis. In rather rare instances it may result from violent exertion, or from drunkenness and exposure to great cold or heat, followed by œdema, possibly by death. As symptoms this primary congestion presents cough, rapid breathing, frothy, blood-tinged expectoration, harsh respiration with fine moist râles, and absence of fever unless there is co-existing inflammation. Passive hyperæmia may be mechanical or hypostatic. Mechanical congestion is due to the presence of some obstruction to the return of the blood to the left side of the heart, such as emphysema or affections of the left ventricle, especially mitral narrowing or incompetency. Rarely it arises from pressure by tumors. The symptoms are cough, shortness of breath, blood-stained, frothy expectoration, and possibly spitting of blood (hæmoptysis). Hypostatic congestion (settling of blood to the lowest parts of the lungs) occurs in conditions of great debility attended by feebleness of the heart, and is favored by prolonged lying upon the back. It is therefore most common in long-continued typhoid fever, paralyses, prolonged unconsciousness, abdominal dropsy or tumors, and wasting diseases, especially tuberculosis and cancer. The physical signs are slight dulness over the bases of the lungs posteriorly, with weak or harsh and perhaps broncho-vesicular respiration, and moist râles.

Œdema of the Lungs.—This condition — an effusion of watery fluid (serum) from the capillaries into the air-cells and their walls — is almost invariably a sequel of congestion or inflammation of the lungs. It may be local, surrounding a circumscribed and usually inflammatory lesion; or general, due to causes in all respects similar to those which produce congestion. Pulmonary œdema occurs most commonly in connection with pneumonia, cancer, grave anæmias, Bright's disease, acute specific fevers with weak heart, valvular disease of the heart, and apoplexy. The œdema may occur suddenly, especially in Bright's disease. Usually its onset is gradual. The symptoms are increasing shortness of breath (dyspnœa), blueness (cyanosis) of fingers, lips, and skin, cough, and abundant watery, frothy, perhaps blood-stained, expectoration, without fever except from a causative inflammatory or febrile disease. The physical signs are slight dulness over the bases, and weak, perhaps broncho-vesicular, breath-sounds, with many unusually liquid large and small râles.

Embolism of the Lungs.—Foreign bodies (emboli) carried by the blood and lodging in the smaller arteries or capillaries of the lungs usually consist of disintegrated blood-clots (thrombi); less commonly of vegetations from diseased heart-valves, or masses of pathogenic germs. As a result of the cutting off of the blood-supply circumscribed dark-red wedge-shaped areas of necrosis (hemorrhagic infarctions) occur. Emboli may be non-septic (not containing disease-germs), originating most commonly from chronic disease of the heart; or septic, arising from a gangrenous or suppurating focus in some part of the body. A non-septic infarct may in time be replaced by scar-tissue; if septic, abscess or gangrene of the lung may result. If the embolus is so large as to obstruct a main branch of the pulmonary artery, sudden death may take place. In occlusion of medium-sized branches there will be cough, spitting of blood, intense breathlessness, fainting, perhaps coma and convulsions. When the smallest branches are involved there may be slight cough, hæmoptysis, and dyspnœa. The spitting of dark frothy blood during the course of chronic cardiac disease is particularly suggestive. If the infarction is very large the physical signs of a limited consolidation are present, followed, if the embolus is septic, by the evidences of pulmonary abscess or gangrene.

Pneumonia.—Two main varieties are recognized, lobar pneumonia and broncho-pneumonia.

Lobar Pneumonia.— This disease (called variously croupous pneumonia, pneumonitis, lung fever, inflammation of the lungs) is caused directly in the large majority of cases by the *Diplococcus pneumoniæ* (or *lanceolatus*) of Fraenkel. Exposure to cold and wet, alcoholism, and debility from pre-existing disease predispose. One attack renders a second more likely. Three stages are recognized in the pathological anatomy, congestion, red hepatization, and gray hepatization. In the first stage the lung is deep-red, rather firm, does not collapse, and the cut surface exudes a frothy, blood-stained, watery fluid. In the second stage the affected portion is dark-red, firm, and sinks in water. It tears easily, the torn surface is granular and dry, and the air-cells (alveoli) are filled with coagulated fibrin containing many red and some white blood-cells. In the third stage the color becomes a mottled gray, and the cut surfaces are moist. The exudate in the alveoli undergoes softening and liquefaction, and is either expectorated or carried away by the lymphatics.

The symptoms of a typical case begin abruptly with a severe chill, and a sharp stabbing pain in the side, followed by a quick rise of temperature to 104° or 105° F. The breathing is rapid, varying from 40 to 60 or over, with an expiratory grunt, and a dry, restrained, and painful cough. The face is flushed, there is often a circumscribed redness on the cheek of the affected side, and the nostrils dilate with each inspiration. A thick, tenacious, rusty, or blood-stained expectoration appears. The pulse is rapid (100 to 120) and bounding. The tongue is coated, the bowels constipated, the urine scanty, high-colored, often slightly albuminous, and as a rule strikingly deficient in chlorides. The lips are often bluish and present herpetic eruptions (cold-sores). Delirium is frequently manifest. In the majority of cases there is an increased number of white cells in the blood (leucocytosis), the count ranging from 12,000 to 50,000. The fever, having risen to its highest point (as a rule within 24 hours), remains high, with remissions, for from 5 to 10 days, when typically it falls (by crisis) within a few hours (5 to 12) to or below the normal.

With reference to the physical signs: Compensatory increase of the movement of the unaffected side may be observed, and the vocal fremitus over the affected portion of the lung is increased, unless the bronchial tubes are filled with a thick secretion. There is marked dulness over the solidified lung areas. The percussion-note over the healthy parts of the lung, especially over those portions lying above an area of consolidation, may be hyper-resonant, or even tympanitic. In the early stages the breath-sounds may be weak, and the crepitant râle is often audible at the end of inspiration. As consolidation occurs, the breath-sounds become broncho-vesicular and finally intensely bronchial. The spoken and whispered voice-sounds are conveyed with great distinctness. During the second stage no râles may be heard, but friction sounds are often present. In the third stage (resolution) small moist crepitations (*râle redux*) become audible.

Death may take place at any time during the disease. It is a very fatal malady in drunkards, and in persons of 60 years or over (60 to 80 per cent); so also in infants under one year. As a rule, above one year, the younger the patient the better the outlook for recovery. The most common cause of a fatal result is the toxæmia (blood-poisoning) due to the causative germ, and the heart-weakness arising therefrom. Meningitis as a complication is always lethal. Unfavorable symptoms are the supervention of the "typhoid status," very high fever (105° F. or over), marked cyanosis, severe dyspnœa, rapid extension of the disease to other lobes or to the opposite lung, and increasing weakness of the heart with pulmonary œdema.

In some instances of recovery the consolidation may persist for from eight to ten weeks (delayed resolution), during which there is fever of a remittent type. In rare cases lobar pneumonia may terminate in abscess, gangrene, or chronic fibrosis. Recurrences are frequent; third or fourth attacks are common, and eight to ten have been reported. Relapses are rare.

Like other infections due to specific microorganisms, lobar pneumonia may present striking variations both in symptoms and character. Thus the fever may be slight or entirely absent in old persons and chronic alcoholics. The crisis may be as early as the third day. The fever may terminate by lysis (gradual fall) instead of by crisis(sudden fall), especially in children. There may be a false (pseudo) crisis two or three days previous to the final fall. Not infrequently cough and expectoration are slight or absent in the very old, the very young, in topers, and in those previously ill with serious acute or chronic maladies. The sputum may be of a red, rusty, yellow, or dark-brown ("prune-juice") color. Very seldom there is spitting of blood early in the disease. Pain is absent in deep-seated pneumonias when the pleura is not involved. In children the pain is usually referred to the abdomen; and abdominal pain, often severe, and generally due to involvement of the diaphragmatic pleura, is not uncommon in adults. Tympanites (excessive amount of gas in intestines) is by no means rare. The pulse may be dicrotic in severe cases, or small and rapid, or full but soft and followed by serious weakness of the heart. The character of the pulse is no indication of the manner in which the right ventricle is standing the strain of pulmonary obstruction. A more reliable criterion is the pulmonary second sound, which, if accentuated, shows that the lesser circulation is being maintained. A persistent absence of leucocytosis is, except in mild cases, a symptom of bad omen. Convulsions often initiate the disease in children, and in them the symptoms may closely resemble those of meningitis. Deafness not depending upon inflammation of the middle ear is not infrequent. The delirium of lobar pneumonia may be active or maniacal, especially in drunkards.

The variations in the character of the disease depend partly upon the site and extent of the local lesions, but mainly upon differences in the resisting power of the patient and the virulence of the pneumococcus. Among the atypical cases are those occurring in old persons. In them the disease is often latent, there is no chill, and but slight cough or expectoration. The general prostration is marked, while the physical signs are indefinite or obscure. In infants and young children the disease frequently begins at the apex (top) of the lungs, the temperature is high, and convulsions, delirium, stupor, and coma are often prominent symptoms. Not infrequently vomiting and diarrhœa are so severe and persistent that the pneumonia may be overlooked. Typhoid pneumonia is characterized by muttering delirium, dry brown tongue, teeth covered with sordes, twitching of the tendons (*subsultus tendinum*), and perhaps picking at the bed-clothes or grasping at imagined objects in the air (*carphologia*)—symptoms resembling those which may appear in a severe attack of typhoid fever. In drunkards the disease may begin gradually, the fever may not be high, the delirium is commonly of the violent type, and the typhoid status often develops, ending in death by exhaustion. The localization of pneumonia is variable. Most frequently the right lower lobe is attacked, and in double pneumonia both lower lobes are usually involved. When the consolidation steadily advances from lobe to lobe it is called wandering or migratory pneumonia. Cases presenting delayed physical signs are very perplexing unless rusty sputum is present. The evidences of consolidation may not appear until the fifth or even the eighth day of the disease, a fact doubtless to be explained by the consolidation beginning in the centre of the lung and extending slowly to the surface.

Among the complications of lobar pneumonia the most frequent is pleurisy, either serous or purulent (empyema). When the pleurisy is so severe and extensive that it rivals or surpasses the pneumonic element it constitutes pleuro-pneumonia. The ordinary dry pleurisy which covers the consolidated area, and which is responsible for the stabbing pain in pneumonia, cannot be considered a complication. When a pleurisy follows pneumonia an irregular, perhaps slight, rise of temperature persists, the physical signs of fluid in the pleura become manifest, and leucocytosis continues. Endocarditis, usually affecting the left side of the heart, is the next most frequent complication, and it may be of the ulcerative type. From 15 to 25 per cent of cases of the malignant form of the disease originate from pneumococcic infection. Symptoms are uncertain and sometimes absent. A prolonged irregular fever, with chills and sweating, is suspicious; if evidences of embolism occur, and meningitis is present, together with the development of a loud diastolic murmur not previously found, the diagnosis of ulcerative endocarditis is assured. Pericarditis, usually fibrinous or serous, rarely purulent, occurs particularly in the double or left-side pneumonia of childhood. It is often latent or overlooked. Increased dyspnœa, weak pulse, and præcordial pain may declare its presence. Meningitis, a very serious and fatal complication, is fortunately rare, and when occurring often co-exists with malignant endocarditis. Marked cervical retraction, intense headache, delirium, and coma indicate a basilar inflammation. Meningitis of the convexity is usually not recognized. Jaundice of toxæmic origin is very common in some epidemics of pneumonia Otitis media is not infrequent in children, parotitis is of occasional occurrence, so also are colitis and venous thrombosis. Nephritis, peritonitis, peripheral neuritis, embolism of the femoral or other large artery, and cerebral embolism with aphasia and hemiplegia are rare complications. Pneumonia and malarial fever may either precede or occur during an attack of pneumonia. Redness, swelling, and pain in one or more joints may become manifest during or after the crisis of a pneumonia, and the inflammation proceed to suppuration. The pneumococcus is found in the diseased joints (pneumococcic arthritis).

The diagnosis of lobar pneumonia is as a rule readily made, most cases presenting distinctive and unmistakable symptoms. The disease may be overlooked in the very old or the very young, or in those already seriously ill. Hypostatic congestion can usually be distinguished from pneumonia by the absence of rusty sputum, or of fever, and is commonly bilateral. In pulmonary œdema, cardiac disease or nephritis usually co-exist, and although dyspnœa, cough, and expectoration are present, there is no fever, the breath sounds are weak, there are numerous fine and coarse liquid râles on both sides of the chest, and marked dulness and bronchial respiration are absent. In œdema the sputum is fluid, frothy, and not rusty. Acute bronchitis in children may simulate pneumonia, but there is no chill, convulsion, dulness, or bronchial breathing, the fever is not so high as in pneumonia, and there are dry and moist râles over both sides of the chest. Broncho-pneumonia generally follows a bronchitis or an acute infection like measles. The fever is irregular, lasts for weeks, and does not terminate by crisis. The sputum is streaked with blood rather than rusty. The physical signs consist mainly of dry and moist râles over both chests. If evidences of consolidation are found they lie in a vertical strip on both sides of the spine, while, on the other hand, in lobar pneumonia they are quite as well and often better perceived on the sides of the chest. Pleurisy with effusion is very rarely mistaken for pneumonia, except in children. In pleurisy there is seldom a chill, the fever is not so high and declines by slow lysis, the cough is dry, and there is no rusty sputum. The affected side is distended, vocal fremitus is absent, the line of dulness may shift as the patient is moved, the voice-sounds are absent or diminished, or there is egophony (a quavering quality of sound), and the respiratory murmur is absent or decreased. Bronchial breathing, if heard, is distant. The apex-beat may be displaced. Finally puncture affords proof positive of the presence of fluid. Acute pneumonic phthisis may exactly resemble lobar pneumonia until the eighth or tenth day, when the fever continues with profuse sweats, and the signs of softening (gurgling râles, amphoric or cavernous breathing) gradually appear. The sputum becomes green, and tubercle bacilli and elastic fibres are discovered in it. It may be impossible to distinguish between pneumonia presenting the typhoid status and typhoid fever complicated by pneumonia unless the case is seen from the outset, or rose-spots appear and a positive Widal reaction is present.

The treatment of lobar pneumonia involves careful attention to the details of nursing. The room should be especially well ventilated in order that the air of the chamber should contain the maximum natural percentage of oxygen. Too much bed-clothing and the swathing of the trunk in cotton, both too often seen, tend to keep the fever higher than it would otherwise be, and add to the discomfort of the patient. Absolute rest in the recumbent position together with the use of the urinal and bed-pan is, with rare exceptions, to be insisted upon. The regular free giving of water is of great importance. The diet should be that usually given in fever, comprising milk, clear or diluted, flavored or not, perhaps peptonized, plain ice-cream, and junket; broths of beef, mutton, chicken, oysters, or clams; tea, coffee, or weak cocoa; grape or orange-juice, lemonade, ginger-ale, and fruit-ices; albumin-water, egg-lemonade; and if necessary one of the proprietary liquid foods. The medicinal treatment depends so much on the character of the individual case and the intensity of the special symptoms that it is not practicable to describe it here in detail. There is as yet no specific — a remedy which cures or tends to cure a particular disease — for lobar pneumonia, although in the future a reliable anti-pneumococcic serum ma be discovered. Sodium salicylate and carbonate of creosote, the latter especially, have given apparent good results. One or two initial doses of quinine, say seven or eight grains of the sulphate, are highly recommended. An initial dose of calomel does good service. Side-pain is to be relieved, preferably by mustard, poultices, or the ice-bag; if necessary by the smallest efficient doses of morphine or Dover's powder. The use of oxygen is desirable except in the milder cases. Delirium and restlessness may need the use of trional, veronal, bromides, chloral, camphor, hyoscine hydrobromate, or morphine. For very high fever frictions with cold water are desirable. The cold tub may or may not be advisable, but its use is as a rule not to be commended. For weakness of the heart — the main channel through which life runs away in this disease — strychnine, caffeine, ammonia, and wine or spirits are most useful. In addition may be required digitalis, nitroglycerine, sparteine, strophanthus, camphor, and musk.

Broncho-pneumonia.— This (called also capillary bronchitis, lobular pneumonia, catarrhal pneumonia) is an inflammation of the terminal bronchi and their communicating air-cells, due to the presence of two or more varieties of micro-organisms. Those most commonly found are the *Pneumococcus lanceolatus, Streptococcus pyogenes, Staphylococcus aureus et albus,* and the germs of diphtheria and influenza (la grippe). The disease may come suddenly during good health, or may be secondary to some pre-existent disease. It attacks especially the very young (under five), the very old, or the debilitated of any age. It is most common among those who live in unsanitary surroundings. The primary cases are usually due to cold and exposure. The secondary cases follow acute bronchitis, measles, whooping-cough, diphtheria, scarlet fever, erysipelas, and smallpox. It may succeed the inhalation of food or drink while the patient is unconscious; or operations on the mouth or nose; or any accident or disease which permits germ-containing particles to enter the bronchial tubes.

The pathology of the disease involves the presence of small areas of consolidation around the bronchioles, and small patches of collapsed lung (which can be inflated) due to occlusion of the bronchi. The terminal bronchioles and the air-cells are filled with an exudate composed of leucocytes and degenerating epithelium. The bronchial walls also contain numbers of leucocytes. In the majority of instances both lungs are involved.

The symptoms, if the disease is primary, begin abruptly, with a chill and a rapid rise of temperature, thus resembling lobar pneumonia. If there is a pre-existing bronchitis of the larger tubes the onset is less abrupt and there is rarely a distinct chill. The characteristic symptoms are cough, dyspnœa, rapid respiration (40 to 80) with an expiratory moan, rapid pulse, and perhaps cyanosis. As the disease affects both lungs, the physical signs are bilateral. There are numerous sibilant and sonorous râles, at first and perhaps all through the disease, without evidences of consolidation. If areas of consolidation sufficiently numerous and confluent exist, there will be slight or even decided dulness, broncho-vesicular or bronchial respiration, and increased vocal fremitus and bronchophony. These signs are commonly found at the bases posteriorly and on either side of the spine.

The type of the disease varies. In certain cases (suffocative catarrh) the dyspnœa and cyanosis steadily increase, the cough lessens, the respirations become rapid and shallow, and the râles larger and moister. The patient is drowsy, but restless, and death ensues from weakness and overdistention of the right ventricle. The fever in some instances, especially in children, may be of a remittent type and lead to a mistaken diagnosis of malaria. The primary form in infants and young children sets in abruptly with chill and high fever, and bears a close resemblance to lobar pneumonia; in adults it may begin like a severe acute bronchitis, but the fever, cough, and dyspnœa are more marked than in a bronchitis, and the sputum is tenacious and rusty. The secondary form begins as a bronchitis, often of slow development, with increase in the fever of the primary disease (for example, measles), cough, dyspnœa, and rapid breathing.

The duration is variable. Cases of great severity, especially in children, may prove fatal in from three to six days; the common type ending in recovery endures from one to three weeks; exceptionally the disease may be protracted to six or eight weeks, rarely even to ten or twelve weeks. Death may occur at any time. The fever declines by lysis.

In the diagnosis of the disease the cardinal symptoms are fever, cough, dyspnœa, rapid respiration, and bilateral physical signs. Its differential diagnosis from lobar pneumonia has been stated in the description of the latter disease. From the broncho-pneumonic form of pulmonary tuberculosis the distinction may be extremely difficult. A tuberculous family history, progressive emaciation, the finding of tubercle bacilli in the sputum, and the occurrence of the signs of softening, will declare for tuberculosis.

With regard to the prognosis, it is to be remembered that broncho-pneumonia is always a grave disease. The primary cases usually recover; the fatality is greatest in the secondary forms. In children among the well-to-do the mortality varies from 10 to 30 per cent; in hospitals, and among the very poor, from 30 to 50 per cent. Inhalation broncho-pneumonia is usually fatal because of its frequent termination in abscess or gangrene.

Concerning treatment, the utmost importance should be attached to prophylaxis, for instance, the prevention of the spread of an ordinary bronchitis of the larger tubes to the terminal bronchi, especially in children. Perhaps the most important measure of prevention is to keep the patient in an even temperature of 68° to 70° F., and to avoid all depressing agencies, as overfatigue, improper food, etc. The disease, having declared itself, requires in the main the same management as a lobar pneumonia. Opiates, however, should rarely be employed. Local counter-irritation of the chest, poultices, wet compresses, and frictions with stimulating liniments, constitute a much more important element of the treatment than in lobar pneumonia; so also perhaps do the so-called expectorants, such as the ammonium preparations. If the child is unable to expel accumulated mucus the use of an emetic (ipecac, alum) may be desirable.

Pneumonoconiosis.— This is a chronic pneumonia due to the inhalation of dusts incident to various employments, and giving rise to anthracosis, or coal-miner's disease; chalicosis, stone-cutter's phthisis, or grinder's rot; siderosis, caused by the inhalation of metallic particles by metal-workers; etc. The symptoms and signs are those of chronic bronchitis with emphysema and fibroid changes. In the later stages the lungs may become tuberculous. The prognosis is favorable in the early stages upon quitting the obnoxious work; in advanced cases grave, although the disease is essentially chronic.

Atelectasis.—Collapse of the lungs — partial or entire disappearance of air from the air-cells — may be congenital, occurring in the new-born as a result of weakness or some form of obstruction in the air passages. The acquired variety is due variously to obstruction of the smaller bronchi by mucus; to compression of the lung by large effusions or tumors in the chest; to respiratory paralysis; or to great abdominal distention.

Emphysema.— The lungs in this disease contain an abnormal amount of air. The common form — hypertrophic emphysema — is characterized pathologically by distention of the air-cells and thinning of their walls. The lungs are large, pale, and do not collapse. Many of the pulmonary capillaries are obliterated, thereby causing obstruction in the pulmonary circulation with compensatory hypertrophy of the right ventricle.

The predisposing cause is a congenital weakness of the lung structure; the exciting cause is increased intrapulmonary tension due variously to chronic or severe cough, heavy lifting, glass-blowing, or using wind-instruments.

The symptoms come on insidiously, often in early life. These are dyspnœa, perhaps only on exertion; cough, ultimately becoming chronic; frequent attacks of bronchitis or spasmodic asthma; and cyanosis, with subnormal temperature and cool skin.

When the right ventricle fails there are swellings of the feet and other evidences of general venous congestion. The physical signs are usually distinctive. Inspection shows the short broad barrel-shaped chest of emphysema, with its vertical movement, poor expansion, and prolonged expiratory motion. Usually there is a marked epigastric pulsation. The apex-beat is not seen. The percussion note is hyper-resonant, even slightly tympanitic. The normal limits of pulmonary resonance are extended in every direction. The characteristic auscultatory finding is that of a low-pitched, often wheezy, greatly prolonged expiratory sound. The inspiration is short and weak. Bronchitic râles, at times in great frequency, are often heard.

The course of the disease is essentially progressive and chronic. It is incurable, although the patient may live to old age. Death may occur from intercurrent pneumonia or phthisis, or from failure of the right heart.

The treatment is that of chronic bronchitis (q.v.). When practicable, the subject should live in a warm equable climate in order to avoid recurrent acute bronchitis. The bowels should be kept regular, and the diet carefully supervised to avoid abdominal distention. Inhalations of oxygen, and appropriate treatment by compressed and rarified air, may be helpful. Strychnine, iron, and digitalis are of much service when judiciously employed; so also are the arsenic and iodine compounds.

Abscess of the Lung.— An acute suppurative inflammation caused by pus-producing organisms. The pus collections may be single or multiple. The organisms may reach the lung by way of the bronchi, as in an inhalation pneumonia; or by infective emboli (see Embolism); or by direct extension, as from a purulent pleurisy. Very rarely it is a sequel of an ordinary broncho-pneumonia or lobar pneumonia.

The symptoms are chills, high and irregular fever, sweats, and leucocytosis. In time the physical signs of cavity are manifest. The sputum is yellow or green, of an offensive, but not putrid, odor, and contains particles of lung tissue and elastic fibres.

The prognosis is usually hopeless. There are occasional recoveries in the cases following pneumonia (except of the inhalation type), or the penetration of external abscesses into the lung. If the abscess is single and accessible, operation may be successful.

Gangrene of the Lung.—A result of infection of a necrotic portion of lung by the bacteria of putrefaction, conjoined with an abnormal vulnerability of the tissues. Diabetes and long continued fevers predispose; pneumonia (particularly inhalation-pneumonia), tuberculous cavities, new growths, embolism, and abscess, are the most frequent antecedent conditions.

The symptoms are irregular, generally moderate, fever, with rapid pulse, cough, dyspnœa, and prostration. The physical signs, when present, are those of cavity. The characteristic symptom is the excessively fetid odor of the breath and sputum. The latter contains fragments of lung tissue, elastic tissue, blood pigment, and numerous bacteria. If allowed to stand, the sputum separates into three layers — the uppermost frothy, the middle watery, the lower with a heavy greenish-brown sediment.

The prognosis in the majority of cases is bad. Small strictly circumscribed areas may become encapsulated, the broken down tissue discharging by way of the bronchi. In accessible cavities surgical interference may succeed.

New Growths of the Lung.—The most common forms are carcinoma and sarcoma, usually bilateral and secondary to cancer elsewhere. Associated lesions are pleurisy, enlargement of the tracheal, bronchial, and cervical glands; perhaps also pulmonary gangrene. The symptoms may be latent. Ultimately cough, pain, and dyspnœa appear. The physical signs are variable, depending largely upon the presence or absence of pleural effusion. According to the size and location of the growth pressure symptoms will be present, for example, hoarseness from pressure on the recurrent laryngeal nerve; or distention of the veins and swelling of the face, neck, and arms from the pressure of the growth on the venous trunks in the chest.

The diagnosis depends largely upon the presence of malignant growths elsewhere, or upon the history of the previous removal of such growths. The disease ends fatally with a duration varying from six weeks to two years. Consumption; Consumption, Prevention of.

Glentworth Reeve Butler, A.M., M.D.
Author of 'Diagnostics of Internal Medicine.'

Lung'wort. The name of several plants supposed to have medicinal value in respect to diseases of the lungs. One is a lichen (*Sticta pulmonacea*) growing on the trunks of trees in moist sub-alpine countries. In Siberia it is used as a substitute for hops. Another such a plant is a genus of borages (*Pulmonaria*). The narrow-leaved lungwort is *P. angustifolia*, and the common lungwort, *P. officinalis;* the former is wild. These are European; but an American borage, the blue-blossomed Virginia cow-slip (*Mertensia virginica*) is called tree-lungwort in the Southern States, and used by compounders of simples. A near relative is the sea-lungwort (*Pneumaria maritima*). Another is one of the hawkweeds (*Hieracium pulmonarium*), called French or golden lungwort in Canada. Bullock's or cow's lungwort is the great mullein (*Verbascum thapsus*).

Lunn Hemp. See FIBRE.

Lunt, George, American journalist and poet: b. Newburyport, Mass., 31 Dec. 1803; d. Boston, Mass., 17 May 1885. He was graduated from Harvard in 1824, studied law and was admitted to the Essex bar in 1827. He sat in the State legislature, was appointed United States District Attorney by President Tyler and during the Civil War was associate editor with George S. Hillard (q.v.) of the Boston *Courier*. He published 'Poems' (1839); 'The Age of Gold' (1843); 'The Dove and the Eagle' (1851); 'Lyric Poems' (1854); 'The Union,' a poem (1860); 'Origin of the Late War' (1866); 'Old New England Traits' (1873).

Lupercalia, lū-pėr-kā'lĭ-ạ, an ancient Roman festival celebrated annually in honor of Lupercus, an ancient pastoral god of the Italians, afterward identified with the Arcadian Pan, who protected the flocks against wolves and gave them fertility. The festival dates from the earliest period of the history of Rome; it was held on the Lupercal, where Romulus and Remus were supposed to have been nurtured by a she-wolf. The day of celebration was 15 February, which was originally the last month of the Roman year.

Lu'pine, a genus of annual and perennial herbs and a few shrubs (*Lupinus*) of the order *Leguminosæ*. The species, of which there are about 80, are sparsely represented in the Mediterranean region and in the Eastern United States, but most numerous in the Western and Pacific Coast States. They have usually digitate leaves; pea-like showy blue, yellow or white flowers in terminal racemes; and rather flattened pods containing several large seeds. Several of the species have been long used for forage, for human food, and for green manuring. Many others are grown for ornament. They thrive especially well upon light, dry soils deficient in lime, and are said to fail upon wet and limy soils. They are readily propagated by means of seed, or, the perennials by division, but these cannot be satisfactorily transplanted when once established. The most important species are the blue lupine (*L. hirsutus*), the white lupine (*L. albus*) and the yellow lupine (*L. luteus*), all of Old World origin. The plants are rich in nitrogenous matter and are thus especially useful for stock-food as well as green manure. Like clover, peas and beans they can obtain free nitrogen from the air by means of their root tubercles. The ripe seeds are rich in proteid substances and but for their bitter principle would probably be more popular as human food than they are even in Europe, where their consumption is enormous. The bitterness may be removed by long soaking in water. In America, though gaining in popularity as soil improvers and forage crops, the plants are seldom grown except for ornament.

Lupus, a generic term used to describe several varieties of chronic localized infiltrations of the skin. The most common of these are *Lupus erythematosus* and *Lupus vulgaris.* The former occurs in slightly elevated, scaly, red patches, varying in size, which show a strong tendency to the production of atrophic scars. It is most common on the face, ears, and scalp, more rarely occurring on the hands and feet. It begins in several isolated or grouped red spots little larger than a pin-head, and having a thin scale. These spots increase in size by peripheral extension, while the surface is partly covered by the grayish scales or thin scar tissue. The color is characteristic, and is violaceous. They may remain small, or may grow large enough to cover the side of the face. Practically nothing is known of the etiology. The comparatively small patches have little effect on health, but the disseminated variety may cause death.

Lupus vulgaris is a chronic disease of the skin, due to its invasion by the tubercle-bacillus; characterized by one or more brownish-red lumps or patches that tend to absorption, ulceration, and scar formation. The disease usually begins in childhood, the most frequent site being the face, particularly the cheek and nose. There may be one or more such spots, but they show no tendency to symmetrical development. After a time slightly scaly patches will form by the coalescence of the tiny red spots. Sometimes the disease has a slow course, for years remaining quiescent; in other cases it suddenly takes on a rapid growth. The erythematous form is treated by superficial caustics. *Lupus vulgaris* being a tubercular disease, hygiene is of great importance, and the X-rays and other powerful rays seem to exert a curative influence on the growths.

Luray, lū-rā', Va., town, county-seat of Page County; on the Norfolk & Western railroad; about 100 miles north by west of Richmond and the same distance west by south of Washington. It is situated in a beautiful valley almost surrounded by mounains; nearby are a number of mineral springs. A spring which flows through the town furnishes water-power. It manufactures flour, lumber, wagons, carriages, and some agricultural implements and wooden ware. It has a distillery and a large tannery. The Luray College for Young Ladies is located here. Pop. (1910) 1,218.

Luray Cave, in Page County, Va., is near the town of Luray, and on the Norfolk & Western railroad. This cave was discovered by Andrew J. Campbell and companions in August 1878. It is in the limestone belt of the Shenandoah Valley, on the western side of the Blue Ridge, and extends under the low spurs of some of the mountains. The area explored underlies about 100 acres. Electric lights have been put in, and they enable one to see the numerous stalactites, the tiers of galleries, nearly 300 feet in height, the various rooms or cavities, the colors from white to yellow, brown, and red, and the marks which indicate the action of water for ages. Many of the columns are over 50 feet in height, and are hollow; when struck they give out bell-like notes. Many people visit this cave each year.

Lur'cher, an English breed of dog, a mongrel between a greyhound and a shepherd's dog, whose size is moderate and coat rough, wiry and usually reddish. It is the favorite dog of game-poachers, and has both keen eyesight and strong powers of scent, as well as great speed.

Lusatia, lū-sä'shĭ-a, or **Lausitz**, Germany, an extensive region, bordering on Bohemia to the south, Meissen to the west, Brandenburg to the north, and Silesia to the east. It was formerly divided into two independent margraviates, Upper and Lower Lusatia. Lusatia was granted to the Elector of Saxony in 1635. In 1815 Lower Lusatia (1,740 square miles), with a large part of Upper Lusatia, was ceded to Prussia (in all 3,200 square miles, with 294,700 inhabitants), and was annexed to the governments of Frankfort and Liegnitz. The part of Upper Lusatia which remained to Saxony (953 square miles, with population (1900) 405,173) now forms the circle of Bautzen, comprising the eastern part of the kingdom. It is not very fertile, hardly supplying half of the consumption of its inhabitants. Flax is raised in all parts, but great quantities are imported for the use of the manufacturers. Linen, woolen, and cotton are the principal manufactures.

Lush, Charles Keeler, American journalist and novelist: b. La Crosse, Wis., 5 Dec. 1861. He learned the printers' trade, was reporter on Chicago *Evening Journal*, now *Record-Herald*, and Milwaukee correspondent of that paper, 1889–1901. He has published ‘The Federal Judge’ (1897); ‘The Autocrats’ (1901).

Lusiad, lū'sĭ-ăd, a celebrated Portuguese epic poem, written by Camoens in 1571 on the establishment of the Portuguese empire in India.

Lusitania, lū-sĭ-tā'nĭ-a, Spain, the name of an ancient region which occupied about two thirds of the west coast of the peninsula and extended eastward to the Anas (Guadiana). The inhabitants were warlike and brave, lived upon plunder, and were rude and unpolished in their manners. The Romans had great difficulty in conquering them, being frequently defeated by Viriathus, chief of the Lusitanians, who was captured by treachery and put to death, about 140 B.C., Lusitania shortly afterward coming under Roman control.

Luska, Sidney. See HARLAND, HENRY.

Lus'san, Zélie de, American vocalist: b. New York 1863. Her parents were French, her mother an accomplished singer, and the girl was but nine when she made her first public appearance. After singing at Wagner festivals, she made her operatic debut in 1886, as a member of the Boston Ideal Opera Company, singing in the part of Arline in the ‘Bohemian Girl.’ She went to London in 1889 and joined the Carl Rosa opera troupe. Her reception in England was marked by great cordiality. In 1894 she made a successful appearance at the Metropolitan Opera House in New York; during the following years sang in Spain and Portugal, and in France. In 1897 and 1899 she again came to the United States, and her concert tour here in 1902 will be remembered. She has appeared upward of 600 times as Carmen, and among her other favorite roles are Marguerite, in Berlioz's ‘Damnation de Faust’; Mignon; Marie, in ‘La Fille du Régiment’; Zerlina, in ‘Don Giovanni’; and Musette, in ‘La Bohème.’

Lustra'tion, in ancient Rome, a ceremony of solemn purification or consecration of the Roman people, by means of an expiatory sacrifice, which was performed after every census. The sacrifice consisted of a bull, a sow, and a sheep or ram. The ram was dedicated to Jupiter, the swine to Ceres, and the bull to Mars. As this lustration took place at the end of every five years, *lustrum* came to signify a period of five years.

Lutangas, loo-täng'äs, Philippines, a mixed race of Moros and Subanos, inhabiting the island of Olutanga and the neighboring coast of Mindanao. They are Mohammedans. See PHILIPPINE ISLANDS.

Lutayos, loo-tä'yōs, or **Lutàos**, Philippines, a Moro tribe living in the district of Zamboanga, island of Mindanao; their name appears to be a Hispanicized form of the Malay word Orang-Laút. See PHILIPPINE ISLANDS.

Lute, a stringed musical instrument formerly much in use. It originally contained six strings, but the number was gradually increased till it reached 24. The lute consists of four parts, namely, the table, the body, constructed of nine convex ribs; the neck, which has as many frets or divisions; and the head or cross, in which the screws for tuning it are inserted. In playing this instrument the performer strikes the strings with the fingers of the right hand, and regulates the sounds with those of the left. The notes of the lute are generally written on six lines, and not on five. There were formerly various kinds in use.

Luther, Martin, German religious reformer: b. Eisleben, Saxony, 10 Nov. 1483; d. there 18 Feb. 1546. Hans Luther, his father, a miner in very humble circumstances, removed with his family to Mansfeld in 1484, and in the course of time was appointed to a seat in the council. Martin was educated in the deepest respect for religion, and under the severest discipline, his parents practising the most austere lives of virtue and piety. At 14 he was sent to the school at Magdeburg, whence he removed in 1499 to Eisenach. At first he obtained his support by singing songs at the door like many other poor scholars; but was soon taken under the care of a benevolent lady named Ursula Cotta. At school he made rapid progress in Latin and in other studies; in 1501 he entered the University of Erfurt, where his mental ability soon won him distinction among his fellows. In 1505 he received the degree of Master. He was originally destined by his father for the law, but circumstances at this time turned his attention to religious truth, and he began the study of divinity. Then to the surprise and regret of his father came the young man's «great renunciation» and his determination to enter the monastery of the Augustines at Erfurt in 1505. Luther regarded himself as an unprofitable servant, tortured himself with bitter reproaches, and was attacked by a severe fit of sickness, during which one of the elder brothers consoled him and promised him the forgiveness of his sins through faith in Jesus Christ, a doctrine which Luther afterward declared brought a new light into his soul. He was also much encouraged by Staupitz, the provincial of the Order, who perceived his great talents and encouraged him to continue his theological studies. Staupitz himself had a singularly clear gospel conception of the cardinal doctrines of faith, repentance, the love and holiness of God, and it is no doubt true that Luther owed much of his «insight» into truth and the opportunity to give it expression to the kindly vicar-general. It is also well to remember in considering the life and work of Luther that some of his best and most cherished works — the Epistles to the Romans and the Galatians, his edition of Tauler's 'Theologia Germanica,' and the exposition of the Seven Penitential Psalms were conceived while he was a member of his Order.

In 1507 he was ordained priest, and in 1508, by the influence of Staupitz, Luther was called by Frederick of Saxony to the chair of philosophy at the newly founded University of Wittenberg. He lectured on the Aristotelian philosophy at the University as well as in the monastery, and at the same time began his activity as a preacher. In 1510 he made a journey to Rome on business of his Order. In 1512 he took the degree of doctor of theology. It was shortly after this, in 1514, that Leo X. issued a bull, granting an indulgence to all who should contribute to the rebuilding of St. Peter's church at Rome. Tetzel, a Dominican friar, was chosen by the cardinal archbishop of Mainz, who, jointly with the guardian of the Franciscan friars, was named commissary of the indulgence for Saxony and the north of Germany, to preach the indulgence through this district. It was the preaching of Tetzel which was the occasion of the beginning of the Reformation. Tetzel was preaching at Juterbogk, a few miles from Wittenberg, when, on the eve of All Saints' day, 31 Oct. 1517, Luther affixed his 95 theses to the door of the Schlosskirche, challenging the Dominican friar. Though carefully guarded in their wording, Luther's propositions were clearly contrary, in some respects, to the current doctrine. The 6th thesis denied the power of the keys, and maintained that the pope can only *declare* a sin to be forgiven by God; the 36th, that through true contrition a Christian is freed from all guilt and punishment; the 66th spoke not of abuses, but said of indulgences in general that they were nets to catch money with; but the 71st declared anathema to him who would reject indulgences altogether. It is clear that Luther at this time had no conception of the Reformation as a movement in opposition to the Catholic Church, nor any idea of denying the supremacy of the chair of Saint Peter, but was worked into a fury by abuses which he thought the ecclesiastical authorities were not sufficiently active in regulating, and his zeal carried him to the breaking point with the ancient church. His propositions were condemned as heretical as soon as they appeared. Hoogstraaten, a Dominican of Cologne, Eck at Ingolstadt, and Prierias, an officer of the Roman court, immediately made replies to his theses; but neither argument, invective, the summons to Rome, which he did not obey, nor the mild counsels of Cardinal Cajetan at Augsburg in 1518, and of the nuncio Militz at Altenburg in 1519, were sufficient to induce him to recant. His replies were made with great boldness and determination, and even after his dispute with Eck at Leipsic in 1519, he still maintained the invalidity of indulgences and of the supremacy of the pope. He appealed from the decision of Cardinal Cajetan to the pope, and from the pope to a general council.

In the year 1519 occurred the famous public disputation, at Leipsic, between Luther and Carlstadt on the one side and Eck on the other, upon the questions at issue. The result was barren. Both sides claimed the victory, and the contestants parted unchanged in their respective attitudes. The Leipsic disputation only precipitated a long and bitter controversy, and Luther remained as determined in his opposition as ever. Militz tried once more to make peace, and met Luther for a second time at Liebenwerda. But the conference was again without fruit. Luther's position had now grown more and more radical, though as yet there was no formal, complete, and definite rupture with Rome. The controversy by this time had spread throughout all Germany, and princes and people were arrayed in bitter factions over the issue. Early in 1520 Luther appealed to Charles V., who had succeeded the Emperor Maximilian. He also addressed letters to the bishops of Mainz and Merseburg to enlist them in his cause. The bishop of Mainz, in his reply, treated the questions at issue as of a trivial and frivolous character, and the bishop of Merseburg repudiates Luther's position and exhorts him to submit. Among his friends at this time were Willibad Pirkheimer and Albrecht Durer, though they did not follow him when the formal break with Rome came. Ulrich Von Hutten encouraged and urged him forward. Franz von Sickingen and Sylvester von Schaumberg declared their readiness to put a number of armed knights in the field for him, should it be necessary. Two notable books now appeared from his pen defining his attitude: 'To the Christian Nobility of the German Nation,' and the 'Babylonian Captivity.' In the former he proclaims the universal priesthood and declares against any especially instituted priestly order. He also contests the right of the pope to interpret the Bible, which he declares to be free to everybody. He likewise inveighs against the pope's exclusive right to summon a general council. In the 'Babylonian Captivity' he altogether repudiates the doctrine of indulgences, holds that the papacy is nothing but Babylon, and reduces the sacraments to three only: «Baptism, Penance, and Bread.» The latter work was in preparation when the bull of excommunication against Luther arrived in Germany.

The attitude of Luther was more and more one of outspoken opposition to the pope and to the doctrines of the Church itself, and so far had his opposition now advanced that the Roman authorities decided to proceed to extreme measures to crush it. In October 1520, therefore, the memorable bull excommunicating Luther and his friends was published at Leipsic. His writings were burned at Rome, Cologne, and Louvain. The answer to the papal bull was characteristic of Luther. At Wittenberg 10 Dec. 1520 he burned the bull of excommunication and the decretals of the papal canon. By this act he dissolved all connection with the pope and the Roman Catholic Church. Frederick, the elector of Saxony, doubted whether he should protect

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him. But the German noblemen, Hutten, Sickingen, Schaumburg, whom he called upon to defend the new opinions, hailed him as the champion of religious liberty, and offered him the protection of their fortresses and their arms. On 28 January Charles V. opened the Diet of Worms, and commanded Frederick to bring Luther with him to appear before that body to answer for his conduct. Frederick demurred, on the plea of his fear for the safety of his protégé. When, however, Luther's opinion was asked, he declared that he was ready to appear, and that not even illness would hold him back. In the meantime Charles had revoked his command in order to allow the 60 days to pass granted by the bull of excommunication. Another papal bull was issued, however, after the burning of the first, in which Luther was definitely declared a heretic, and an interdict put upon all places harboring him. Summoned a second time before the Diet, he expressed his willingness, if he were granted a safe conduct, which was accorded him by the emperor. He was met by about 2,000 persons on foot and on horseback at the distance of a league from Worms. When the palatine sent a messenger to warn him of his danger he answered «If there were as many devils in Worms as there are tiles upon the roofs of its houses I would go on.» Before the emperor, the Archduke Ferdinand, 6 electors, 24 dukes, 7 margraves, 30 bishops and prelates, and many princes, counts, lords and ambassadors Luther appeared, 17 April, in the imperial diet, acknowledged all his writings, and on the following day made his defense before the assembly. He concluded his speech of two hours with the words: «Let me then be refuted and convinced by the testimony of the Scriptures or by the clearest arguments, otherwise I cannot and will not recant, for it is neither safe nor expedient to act against conscience. Here I take my stand; I can do no otherwise, so help me God! Amen.» Frederick the Wise conveyed him privately to the Wartburg to save his life. Luther took advantage of this retirement to translate the New Testament into German. But this seclusion continued only 10 months. When informed of the disturbances excited by Carlstadt on the subject of images he could no longer endure restraint, notwithstanding the new outlawry which the emperor had issued against him at Nuremberg; and at the risk of provoking the displeasure of the elector he hastened to Wittenberg, through the territory of George, duke of Saxony, who was one of his most bitter enemies. The sermons which he delivered for eight sucessive days after his return (in March 1522) to quell the violence of the enraged insurgents in Wittenberg are patterns of vigorous and popular eloquence.

Amidst these disputes and attacks his plans for a total reformation of the Church were matured. In 1523 at Wittenberg he began to revise the liturgy, and in 1524 laid aside his cowl. In 1525 Luther married Katharina von Bora, who some years previously had left the cloister and joined the reformed religion. He prepared, from 1526 to 1529, a new church service, corresponding to his ideas of the doctrines of the gospel, under the patronage of the elector and with the aid of Melanchthon (q.v.) and other members of the Saxony Church. His larger and smaller catechisms, to be used in schools, were also of great service. An unsuccessful effort was made in 1529, at Marburg, in a conference between Luther and Zwingli, the Swiss reformer, to bring the German and Swiss movements into harmony. But Luther's peremptory refusal to accept Zwingli's views upon the question of the Lord's Supper precluded any possibility of agreement. The Reformation (q.v.) spread rapidly, and the Augsburg Confession, the earliest symbol of Lutheran Protestantism, was drafted by Melanchthon from articles prepared by Luther. During all these years he waged a ceaseless polemic against Rome, and made strenuous efforts to establish harmony among German Protestants. The intolerance which he manifested toward the Swiss reformers, because their views differed from his own in regard to the Lord's Supper, show that he was not yet ready to grant that liberty to others which he demanded for himself. He was in this matter the chief cause of the separation which took place between the Calvinists and the Lutherans. The rapidity with which the Reformation advanced after the Confession of Augsburg in 1530 rendered the papal bulls and the imperial edicts against Luther ineffectual. In 1537 Luther wrote the Schmalkaldic articles; he gave no heed to the ambassadors of Brandenburg and Anhalt, who were sent in 1541 by the Diet of Ratisbon to make him more submissive to the Church, and in 1545 he refused to participate in the Council of Trent.

The occasional asperity which he showed in the defense of his faith, however, by no means diminished the merit of his constancy; and an apology may easily be found for the frequent rudeness of his expressions in the prevailing mode of thinking and speaking; in the nature of his undertaking which required continual conflict; in the provocations by which he was perpetually assailed; in his frequent sickness; and in his excitable imagination, evident from the days of his novitiate. The same excitability of temperament will serve to explain those dreadful temptations of the devil which disquieted him. That age regarded the devil with horror as a personage ever active; and those devoted to the cause of God felt themselves constantly obliged to resist attacks of the evil one. Luther himself says «I was born to fight with devils and factions. This is the reason that my books are so boisterous and stormy. It is my business to remove obstructions, to cut down thorns, to fill up quagmires, and to open and make straight the paths; but if I must necessarily have some failing let me rather speak the truth with too great severity than once act the hypocrite and conceal the truth.» No one can behold without astonishment his unwearied activity and zeal. The work of translating the Bible, which might well occupy a whole life, he completed, with some assistance from Melanchthon and other friends, between 1521 and 1534. This translation takes the same place in Germany as the King James version does in England and the United States with regard to the religious life and literature of the people. Luther equaled the most prolific authors in the number of his treatises on the most important doctrines of his creed. After the year 1512 he preached several times every week, and at certain periods every day; he officiated at the confessional and at the altar, he carried on an extensive correspondence in Latin and German on various subjects with men of rank and of distinguished literary attainments and with his private friends. He gave advice and assistance wherever it was needed and interested himself on behalf of every indigent person who applied to him. In company he was lively, and abounded in sallies of wit and humor preserved in his 'Tischreden' ('Table-Talk'). Luther was no stranger to the elegant arts. His excellent hymns such as 'Ein' feste Burg,' 'Aus tiefer Noth,' are well known. His fondness for music, too, was such that he would often relax his mind with composition, with singing, and playing on the flute and lute. Just before his last journey to Eisleben, where he was summoned by the Count of Mansfeld to settle a dispute, he wrote, in a letter to a friend, the following description of his condition: "Aged, worn out, weary, spiritless, and now blind of one eye, I long for a little rest and quietness; yet I have as much to do in writing and preaching and acting as if I had never written or preached or acted. I am weary of the world, and the world is weary of me; the parting will be easy, like that of a guest leaving the inn; I pray only that God will be gracious to me in my last hour, and I shall quit the world without reluctance." His wife died in 1552. Luther's works are partly in German, partly in Latin. Of earlier editions the most complete is that by Walch (1740–53); and of later, the Erlangen-Frankfort editions (German writings 1826–57; Latin writings 1829–86), and that published at Weimar (1883 et seq.). There are separate collections of his letters and his table-talk. Of accounts of his life may be mentioned those by Meurer (3d edition, 1870); Köstlin (4th edition, 1889), English translation (1883); and Peter Bayne (1887). Consult also Beard, 'Martin Luther and His Reformation in Germany'; Tulloch, 'Leaders of the Reformation'; and Lindsay, 'Luther and the German Reformation' (1900). For Roman Catholic view of Luther consult: M. Evers, 'M. Luther, Lebens- und Charakterbild' (1883–91); Verres, 'Luther' (1884); Janssen, 'History of the German People' (1900).

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Luther League, The, a society organized in 1895 at Pittsburg, Pa., having for its basis the unaltered Augsburg Confession and receiving into membership any one connected with a Lutheran congregation or a Lutheran institution of learning. Conventions are held biennially. The society publishes a monthly journal 'The Luther League Review.' The organization has a membership in excess of 70,000.

Lutheran Church in America. The first Dutch settlers in New Amsterdam, Manhattan Island, in 1623, brought with them the Lutheran creed and church polity, and in 1664 the first Lutheran pastor took up his residence among them. A colony of Lutherans from Sweden and another from Germany were formed in the following centuries; the Swedes settling on the Delaware (1637–42); the Germans being organized and led by Heinrich Melchior Mühlenberg in 1742. The church grew rapidly under capable ministers, and synods were formed in Pennsylvania (1748); New York (1786); North Carolina (1803); and Ohio (1818).

The General Synod, which was intended to constitute a Pan-Lutheran Alliance in the United States, was founded in 1820, and its organization was of great benefit in centralizing and strengthening the activities, both domestic and missionary, of the church. In 1860 it comprised 26 synods, but one of the unfortunate results of the Civil War was to cut off from the northern synods all those south of the Potomac, who formed themselves into what is known as the United Synod of the South. In 1866 the General Synod became divided over the questions of conservatism and liberalism, one party desiring to draw closer the distinctive lines of Lutheran doctrine and polity, the other preferring to Lutheran exclusiveness an inter-communion and a fraternal understanding with other denominations. The conservatives withdrew from the General Synod in 1867. Uniting themselves with the extensive Lutheran Synods formed by immigrants from Germany, Norway, Sweden, and Denmark, they formed the General Council which took as the basis of its creed the Augsburg Confession, The Apology, the two Catechisms of Luther, the Schmalkald Articles, and the Form of Concord.

The Lutheran Church in the United States has grown with great rapidity in the North and Middle West. Its largest body is the Synodical Conference which embraces the flourishing Missouri Synod, whose nucleus was formed by those earnest religious exiles who in 1839 left Saxony for the United States and settled in Missouri. The Rev. C. F. W. Walther was appointed their pastor in 1841; a synod was organized in 1847, and in 1872 the Joint Synod of Ohio, with other smaller synods, combined with the Missouri Synod to form the Synodical Conference. In 1881 a controversy arose in the Conference on the subject of predestination, which the general body of the Conference had adopted into their creed; the Joint Synod of Ohio dissenting from these views separated from the Conference and the ten districts which it comprehends set up an independent organization. The Synod of Iowa is another independent Lutheran Church which differs with the Missouri Conference on the question of the ministry, holding that all ministerial power and office reside in the whole church and not in the spiritual priesthood. The United Norwegian Lutheran Church was formed in 1889 out of a number of Norwegian Lutheran bodies, and now stands for one fourth of the Scandinavian population of the United States.

Besides the independent Lutheran churches above numerated there are three distinct Norwegian and five German Lutheran churches, two Danish synods, one Finnish and one Icelandic synod. While the General Synod is mostly composed of Anglo-Saxon and English-speaking elements, and the United Synod of the South entirely so, the English congregations of the General Council Synodical Conference are in a small minority. Lutherans in the United States are not strictly speaking congregational in polity. Each congregation is generally made by them to be the unit of administrative power both in the representative bodies and in the court of appeal, and from them the synods gain all their authority. But the Missouri Conference and the Joint Synod of Ohio are composed of congregations perfectly independent and self-governing. The synod has no power legislative or judicial over a congregation, but is merely an advisory body whose decisions must be ratified by the congregation before they can be accepted as decrees of the Church. On the other hand the General Synod, the General Council, and the United Synod of the South have more power of independent action than is the case in the Synodical Conference formed by the Missouri Synod with other synods. The congregations delegate their authority to the General Synod, the General Council, and the United Synod of the South. The clergy and lay delegates in these synods have full authority over ministers, and the general bodies which comprise a number of such synods settle the requirements made of ministers before ordination, and all such details of worship as liturgies, hymn books, and manuals of religious instruction. While the Lutheran Church in the United States has its form of public worship, 'The Common Service,' which was first published in 1883 in its present shape, this book was only adopted by the General Synod, the General Council, and the United Synod of the South with the proviso that a simpler form of service containing only the principal parts of that prescribed in 'The Common Service' might be used by congregations as occasion required.

One of the principal characteristics of the Lutheran Church has been its earnestness in providing for the high education and religious training of its ministry. The Lutheran theological seminaries are generally well equipped and their professors bound by the confessions of their several synods. The oldest of them all is the Seminary of the General Synod founded in 1826 at Gettysburg, Pa. The degree of B.A. is required in candidates for matriculation, and the teaching staff comprises five professors, exclusive of lecturers. The Seminary of the Joint Synod of Ohio was opened in connection with the Capital University, Columbus, Ohio, in 1830, its students have all completed a college course before entering, and with regard to teaching it is one of the most conservative institutions in the Lutheran body. The Theological Seminary of the United Synod of the South was originally established by the Synod of South Carolina at Lexington, S. C. It is at present permanently settled at Mount Pleasant, near Charleston, S. C., with a staff of four professors.

The remaining more important Lutheran Theological Schools are Wittenberg Seminary, founded at Springfield, Ohio, in 1842, under the auspices of the Evangelical Lutheran Church; Concordia Seminary, Saint Louis, Mo., established originally at Altenberg in the same State 1839, and presided over for some 30 years by the Rev. Carl F. W. Walther. It has six professors and more students than any other Lutheran seminary in the United States. The Practical Seminary of the Missouri Synod was originally a department of the Saint Louis Seminary, but in 1875 an independent faculty of five professors was gathered together and buildings provided at Springfield, Ill., where it boasts an attendance of above 100 students. The Seminary jointly controlled by the Synods of New York and Pennsylvania was established at Mount Airy, Philadelphia, in 1864. The Augustana Theological Seminary is a Swedish institution and was organized at Chicago in 1860. It was amalgamated with Augustana College, Rock Island, Ill., in 1875, and has three theological professors; it is bilingual and the ministers educated there can generally preach both in Swedish and English. The Chicago Seminary was founded in 1861, chiefly through the energetic efforts and munificence of the Rev. W. A. Passavant. The Norwegian Augsburg Seminary was opened at Marshall, Wis., in 1869 and removed to Minneapolis, Minn., in 1872; while the United Norwegian Lutheran Church has its divinity school, the United Church Seminary, in the same city where it was founded with three professors in 1890. The German Synod of Ohio has likewise a seminary of its own, which after moving its quarters several times finally settled at Dubuque. It has a teaching staff of four professors, one of whom lectures in English. The following are the statistics of Lutheranism in the United States for the year 1910. Total number of ministers, 8,421; congregations, 13,533; communicants, 2,173,047.

In the early days of American Lutheranism isolation and other causes produced a great diversity in the forms and orders of worship in the scattered Lutheran congregations. This was much deprecated by many leading Lutheran divines. It was felt to act as an element of disunion, sometimes of disorder, and in 1881–3 it was decided to compile and secure the authorization of a Common Order of Service «on the basis of the common consent of the pure Lutheran liturgies of the 16th century.»

The Service in the Common Service begins with the Confession of Sins, followed by the Declaration of Grace, thus corresponding with the Confession and Absolution with which morning and evening prayer begins in the Anglican Book of Common Prayer. Then comes an Introit with the Gloria Patria, or ascription of glory to the three Persons of the Trinity. Next is the «lesser litany» or Kyrie, followed by the «Gloria in Excelsis,» the great liturgic hymns of both Eastern and Western Christianity. Then comes the Salutation and Response. The Collect for the day ushers in the reading of the Epistle, a selection from the writings of the Apostles, and the Gospel — a passage from one of the Evangelists. Very fittingly the Creed, known as the Apostles' Creed, follows the Gospel, after which the principal Hymn of the service is sung. The Lutheran Church is remarkably rich in hymns, and the old airs of the German musicians are often reproduced, while in English-speaking Lutheran Churches the great German hymns of Luther, Rinkart and others are sung in an English version. To the singing of a hymn succeeds the Sermon. The alms of the people are then collected, and after the Offertory the General Prayer is said, the Holy Communion follows. Besides the above described office the Common Service has offices for Matins and Vespers.

Consult: Wolf, 'The Lutherans in America' (1889); Graebner, 'Geschichte der Lutherischen Kirche in America' (1891); Jacobs, 'A History of the Evangelical Lutheran Church in the United States' (1893); Jacobi, 'Lutheran Encyclopedia' (1899).

Lutheranism. The first of the 95 theses which Dr. Martin Luther affixed to the door of the castle-church of Wittenberg on 31 Oct. 1517, read as follows: «Our Lord and Master, Jesus Christ, saying, Repent ye, would have the whole life of believers to be repentance.» This academic act has been generally looked upon as the inaugural act of the Lutheran Reformation, so much so, that 31 October is to this day celebrated by Lutherans in all lands as the Festival of the Reformation. And the thesis quoted above is perhaps the most concise exhibition of Lutheranism extant. The thesis is, as a whole and in all its parts, a positive doctrinal statement. Doctrine, positive doctrine, is, and was from the beginning, of first importance, the groundwork — the very life — of Lutheranism. The first and foremost task of the Lutheran Church is the promulgation and maintenance of sound doctrine. Preaching, in the Lutheran Church, is not primarily exhortation but teaching, and doctrinal preaching is considered the chief element of Lutheran public worship. Even the better part of Lutheran hymnology is preponderatingly doctrinal. The great bulk of Luther's voluminous writings is doctrinal, and no other church has so extensive a doctrinal literature as the Lutheran Church. Even its controversial theology partakes of this character. It is true, the Lutheran Church in all its best periods was eminently an *ecclesia militans;* but the subjects at issue were again doctrinal. Perhaps the most masterful polemical work in Lutheran, if not in all Protestant theology, Chemnitz' 'Examen Concilii Tridentini,' is also one of the richest storehouses of doctrinal theology.

But doctrine is knowledge communicated. Teaching presupposes or implies a master and a disciple or number of disciples. And of the master Luther says in his thesis: «Our Lord and Master Jesus Christ.» No councils nor synods, no traditions of the Church, no Fathers, early or late, not Luther himself, not any of these, nor all of these together, must be acknowledged as empowered to establish articles of doctrine which every disciple is bound to accept. Bound to accept. For the *Master* is also the LORD. He comes with authority; his teaching is not human but divine. Christian doctrine is not a product of evolution, nor of human speculation, nor of self-consciousness of the church, but the truth of God set forth by the Fountain of divine truth, who has said, «I am the Truth.» He is the one and only authoritative teacher in the church. There is no such thing as an evolution or perfectibility of Christian doctrine. Here the ancient *αὐτὸςφα*, «He hath said it,» is in its place. Here man has no alternative but either to accept or to reject. Here to add or to modify is to adulterate, and to take away or to yield is to deny. Such is the Lutheran concept of the primary source of Christian doctrine.

But the means also whereby such communication of divine knowledge to man is effected is indicated in Luther's thesis when he says: «Our Lord and Master Jesus Christ, saying, Repent ye.» Here he refers to an express dictum of Holy Scripture. Christ and the Spirit of Christ taught man in the 16th century and teaches man in the 20th century in and through the written Word. Not by awaiting direct revelations, not by following the traditions of the Church or the definitions or decrees of its representatives, are we disciples of Christ, but by searching the Scriptures which were written aforetime for our learning. What is clearly taught in Scripture, that and that only is Christian doctrine. That the Bible is the only and sufficient source of Christian doctrine is the formal principle of Lutheranism.

The material principle of Lutheranism, the cardinal doctrine, around which all other doctrines radiate, because it is the central doctrine of Scripture, is also indicated in the thesis. Luther there describes the subjects and disciples of their Lord and Master Christ as believers. According to the Lutheran concept of Christianity and the Christian church it is faith that constitutes a Christian and a member of the church of Christ, which is simply the whole number of all believers. Christianity, as distinguished from all other religions, is that religion according to which salvation is not by works of righteousness which we have done, but by what God has done in Christ, reconciling the world unto himself. And faith is simply the acceptance of this reconciliation. Not as a work of obedience, with any merit of its own, but only as the acceptance of the merits of Christ, faith is saving faith. It is justifying faith inasmuch as, in view and consideration of the merits of Christ accepted by faith, God in his judgment pronounces the believer righteous. And this doctrine, that God justifies the sinner by His grace, for Christ's sake, through faith, is the material principle of Lutheranism, the cardinal doctrine of Lutheran theology. This doctrine is looked upon by the Lutheran Church as *doctrina stantis et cadentis ecclesiæ*, the doctrine with which the Church stands and falls.

On the other hand, the doctrine of justification, while the central and ruling doctrine, is not the only doctrine of Lutheranism. According to our thesis, Christ would have the whole life of believers to be repentance. This, too, is a doctrinal statement. Repentance, *μετάνοια*, is a change of heart and mind in man. In his natural fallen state man is wholly evil, spiritually dead in sin, unable to will or to do that which is spiritually good. He cannot, therefore, work his own restoration, nor contribute thereto. But God, prompted by His universal grace, and because of the merits of Christ, the redeemer of all mankind, through the gospel, the ever efficacious and never irresistible means of grace, quickens the sinner into spiritual life, translating him, by the bestowal of faith, from a state of wrath and enmity against God into a state of grace and communion with God. This is the Lutheran doctrine of conversion or regeneration in the stricter sense of the terms. In a wider sense, in which repentance also stands in our thesis, it includes the preservation and growth of spiritual life and its activity in works of the spirit, or sanctification. For while the Lutheran Church maintains that man's salvation is in no sense, manner or measure, his own work, but wholly and solely the work of God, and hence denies the necessity of good works unto salvation, it strenuously asserts that good works are necessary fruits and evidence of faith.

There have been Syncretists, within the pale of the Lutheran Church, who held that the real obstacles to mutual recognition between the

Lutheran Church and others were only two — the doctrines of predestination and of the Lord's supper. But by these assertions Syncretism exhibits itself as thoroughly un-Lutheran in letter and spirit. These differences are indeed, while they stand, insurmountable barriers between the conflicting theologies. But the chasm which separates them is far deeper and wider, a difference of the very fundamental principles which affects a multitude of particular doctrines. The formal principle of Lutheranism is, as we have seen, that of the exclusive authority and absolute sufficiency of the canonical Scriptures in matters of faith. The material principle of Lutheranism is the scriptural doctrine of justification. Lutheranism holds that Christ, the only head and foundation of the church, vested all the rights and powers of the church, the keys of heaven, the power of remitting and retaining sins in his name as his agent, the government and discipline of the church, in the local congregation of believers. Lutheranism maintains that Christ, the only mediator between God and man, has instituted an office in the church, the ministry of the word, for the public administration of the means of grace, that this office is conferred on its incumbent, by Christ's authority through the call of the congregation, and has no power but the power of the word as set forth in the Scriptures, all ministers being equal in rank among themselves. Lutheranism looks upon the Lord's Supper as a means of grace, whereby Christ, by virtue of his words of institution pronounced in the night in which he was betrayed, gives to all communicants his body and blood, really present not by transubstantiation, nor by consubstantiation or the formation of a new substance, but by sacramental union, to be eaten and drunk in, with, and under the consecrated bread and wine, for an assurance of the forgiveness of our sins, procured by his sacrifice on Calvary.

Lutheranism also holds and teaches a doctrine of predestination, not, however, a decree of damnation, but only an election and predestination of the children of God to eternal salvation by faith in Christ Jesus, who is the redeemer not only of the elect, but of all mankind, and by whom the decree of election is determined as by its meritorious cause, and not as an accessory means of execution. Thus, likewise, the gospel and the sacraments, according to the Lutheran concept, are the ordained means, whereby the same universal grace, according to which God earnestly desires the salvation of all men, and, by the power of his Spirit in all cases efficaciously, but in no case irresistibly, exerted through such means of grace, calls, converts or regenerates, sanctifies and preserves to eternal life all those who do not wilfully and obstinately resist the saving grace of God.

Having thus briefly portrayed the nature and principles of Lutheranism, we proceed to a summary sketch of its rise and progress and its spread in the era of the Reformation.

The cradle of Lutheranism was Saxony in Germany. Here, at Wittenberg, the great Reformer taught and preached and wrote under the protection of the Elector Frederick the Wise, and hand in hand with his successors John and John Frederick. The effects of his 95 theses far exceeded the expectations of their author. When Luther published this manifesto, he had no thought of the establishment of a new church. The very name of Lutherans was not adopted by the free choice of those who bore it, but was solemnly inflicted upon them in a Bull published by Pope Leo X. 3 Jan. 1521. By this Bull Luther and his adherents were excommunicated from the Roman Catholic Church, and when Luther had refused to recant at the Diet at Worms, he and the Lutherans were also politically outlawed by an imperial edict, which exposed them to persecution and the death of confirmed heretics. The execution of this edict was suspended in Germany because of the great headway which the Lutheran movement had by this time made, and for various political reasons, which bound the emperor's hands, and at the Diet at Spires, in 1526, the German princes and representatives formally agreed that everyone should so conduct himself toward the edict of Worms as he would deem himself able to answer before God and His Imperial Majesty.

Luther, who had for a time been concealed by the elector in Wartburg castle, had made good use of his enforced rest by translating the New Testament into German and issuing the first installments of his Church Postil, a collection of sermons, from which hundreds of ministers learned how to preach to the people. After his return and during the subsequent years the Lutheran Church in Saxony was organized along conservative lines. Luther provided the congregations with forms of worship and collections of hymns for public service, catechisms for the instruction of young and old and an extensive religious literature. A system of schools of various grades was established throughout the land and an able ministry was educated at the University. The translation of the whole Bible was completed in the course of years. At a second Diet at Spires, in 1529, a majority made an effort to stay the progress of Lutheranism in Germany, and in spite of the protest of the Lutheran members, from which they were called Protestants, these efforts were continued at the Diet at Augsburg, in 1530. Here, however, the Lutheran princes and cities succeeded in presenting to the emperor and Diet and thus publishing to the world, a statement of their faith and doctrine, the Augsburg Confession, which, in the course of time, was adopted as its fundamental creed by the Lutheran Church the world over. (See DIET.) In the same year an apology of the Augsburg Confession was framed and published, which also gained symbolical standing. Although the transactions of the Diet of Augsburg resulted in another proscription of Lutheranism and the inauguration of measures for its extermination, the political conditions of the Empire continued to be such that the emperor and his party could not venture to proceed against the dissenters, and while Luther lived the progress and spread of Lutheranism continued, not only in Germany, but throughout Europe. Even when, after Luther's death, Charles V. marched his armies against his Lutheran subjects and by fraud and force led away into captivity the two foremost of the German Lutheran princes and began the work of stamping out Lutheranism, these reverses, though causing considerable disturbance also within the Lutheran Church, lasted a few years only. The political conditions having once more turned in favor of the suppressed party, the Lutherans, in 1552, by the Treaty of Passau, secured temporary recognition as a church of lawful standing in Germany. This recognition was made permanent by the Peace of Augsburg, in 1555. This settlement included the Lutherans only of all those who dissented from the Roman Catholic Church, Zwinglians, Calvinists, Anabaptists, and others, being excluded. It was thus menacing the religious as well as the political status of Lutheranism, when men of influence in Saxony, the Cryptocalvinists, by clandestine operations endeavored to change the Lutheran Church of Saxony into a Calvinistic establishment. At the same time a number of doctrinal controversies threatened to vitiate the orthodox character of the church of the Augsburg Confession, until, by the united labors of Lutheran theologians and princes, sound in doctrine and deeply concerned about the peace of the church and the purity of its doctrine, the last of the great Lutheran Confessions, the Formula of Concord, closed the series of Lutheran standards, all of which, the Augsburg Confession, its Apology, the Smalcald Articles, Luther's Large Catechism, Luther's Small Catechism, the Formula of Concord, together with the three ancient Ecumenical Creeds of all Christendom, constitute the body of Lutheran Symbols, known as the Book of Concord of 1580.

While Germany was the home of the Lutheran Church, Lutheranism obtained a permanent foothold and became the church of the realm in a number of extra-German countries during the period of the Reformation.

In Sweden Luther's doctrine was disseminated as early as 1519 by two brothers, Lars and Olav Petersen, who had studied at Wittenberg. Under Gustavus Vasa, Lars Petersen was made professor of theology at the University of Upsala, and Olav Petersen was the leading preacher at Stockholm. The Bible was translated into Swedish and at the Diets of Westeras, 1527, at Orebro, 1529, and at Westeras, 1544, the organization of the Swedish Lutheran Church as a national church with an episcopal form of government was effected.

The first Lutheran preachers in Denmark were Peter Lille and Hans Tausen. The organizer of the Danish Lutheran Church was John Bugenhagen, pastor of Wittenberg, who came to Denmark in 1537 and prepared the new Constitution, which was adopted at Odense in 1539. Soon after Norway and Iceland were also Lutheranized, and thus the Lutheran Church was permanently established without bloodshed throughout all the Scandinavian countries.

In Prussia the Lutheran Church was planted and made the church of this ancient territory of the German knights under John George of Polenz, bishop of Samland. The new Agenda and Church-Order was introduced in 1525 and 1526, and the new Lutheran University of Königsberg was a colony of Wittenberg, of which Sabinus, Melanchthon's son-in-law, was the first rector.

In Silesia Luther's doctrine was preached as early as 1518. John Hess was called as a Lutheran minister by the city council of Breslau.

In Poland Luther's writings were prohibited. But in 1521 the Bible was translated into Polish. Jacob Knade preached at Danzig. From Danzig Lutheranism spread to Elbing and Thorn, and by 1548 the Polish Church was preponderatingly Lutheran.

In the Baltic territories, Riga, Dorpat, and Reval were Lutheran in 1523, and within two decades the Reformation spread throughout these whole regions.

In Hungary the doctrines of the Reformation were promulgated by men who had been Luther's students at Wittenberg. In 1549 five free cities adopted the Augsburg Confession, and under the influence of the Reformation numerous elementary and advanced schools were opened in cities and villages throughout all Hungary. Merchants who returned home from the fair at Leipsic brought Luther's doctrine to Transylvania, and others, who had been students at Wittenberg, promoted its spread. A Lutheran school was opened at Hermannstadt. From 1533 John Honter labored as «Evangelist of the Lord at Kronstadt,» and the Reformation took its course from town to town. In cities and villages and in the open country schools were established, and even in the village schools Latin and Greek were taught. With the schools libraries for the people were connected, and endowments were provided for the support of young men who were willing to study at German universities.

In Bohemia and Moravia a large part of the population embraced the Lutheran faith during Luther's lifetime, and when, after the Reformer's death, the emperor made war against the Lutherans in Germany, the Bohemian Lutherans refused to take up arms against their brethren in the faith.

In the Netherlands, also, the church of the Reformation gained headway, principally through the reading of Luther's works. In Antwerp a great Lutheran movement took place, brought on by the preaching of Flacius and Cyriacus Spangenberg, in 1565 and 1566. But it was not long before Lutheran services were prohibited. The Dutch Reformed Church was organized in 1568 and 1571 and proclaimed the church of the realm in 1583. With the Spaniards in possession of Antwerp, in 1585, the Lutherans scattered and founded congregations in Frankfort, Hamburg, Amsterdam, Leyden, and other cities. Even there they had no rest. In Amsterdam they were antagonized and Lutheran services were again prohibited. Still, the Lutheran congregations continued to enjoy a rapid and steady growth; so much so that a scarcity of ministers began to make itself painfully felt. The Lutherans in Holland had made the great mistake of neglecting the establishing of schools and colleges for the education of ministers, and this eventually brought about their decadence; for the importation of preachers from foreign countries was accompanied by the introduction of unionistic, syncretistic doctrines and practices.

France is another country in which Luther's writings were widely circulated and had great influence in the church. A Lutheran congregation was organized at Maux. Faber Stapulensis, Briconnier, Jean and Pierre Leclerc were some of the most noted preachers. Lefèvre translated the Bible into French. A sound Lutheran movement promised a bright future for Lutheranism, but the influence of Geneva, the stronghold of the Reformed Church, was very strong in France, and through this influence the Lutheran movement in France was directed into other channels.

In England Luther's books were read as early as 1519, especially at the universities, where they were of vast influence. Great efforts were made to suppress these books, and they were proscribed very early, but this only had the effect that they were now read more than ever. Thomas Cranmer embraced the Lutheran faith, and, though in many ways inconsistent, he remained a Lutheran in doctrine until the year 1548. A collection of Lutheran hymns was published, being translations of German hymns, most of them Luther's. In 1536 the Augsburg Confession was printed in an exquisite translation by Taverner. In Sarcerius' ‘Commonplaces,’ a Lutheran handbook of Dogmatic Theology was given the English people. Cranmer, in the same year, at the close of which he abandoned Lutheranism, wrote an extensive explanation of Luther's Small Catechism, in which the first English translation of Luther's Small Catechism by Cranmer's hand was embodied. The death of Henry VIII., whose political ambition had been to make himself the head of the Lutheran League of the continent, the personal acquaintance of many English and Scotch refugees with Calvin at Geneva and the imposing work there being reared, and other reasons contributed to the ascendency of Calvinism in England and Scotland, and the Lutheran movement became virtually extinct about the middle of the century.

For Lutheranism in America see LUTHERAN CHURCH IN AMERICA, THE.

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Luther's Hymn, a name given to a celebrated German hymn composed by Luther about 1521. It was entitled “Ein' feste Burg ist unser Gott.”

Lützen, lüt'sĕn, Germany, small town of Prussian Saxony, nine miles southwest of Leipsic. It derives all its interest from the two battles fought in its neighborhood. The first belongs to the Thirty Years' war, being fought on 16 Nov. 1632, between the Swedes under Gustavus Adolphus, and the imperialists under Wallenstein. The Swedish monarch, having joined his forces with those of Bernard, Duke of Saxe-Weimar, attacked the enemy in a strongly intrenched position. The issue was long doubtful, but the Swedes finally triumphed, though Gustavus fell in the action. The place of his death is marked by a square block of granite, called the Schwedenstein (the Swedes' stone). The second battle was fought 2 May 1813, somewhat farther south, at Gross-Görschen. It was the first important conflict between the allied Russian and Prussian armies and the French under Napoleon in that decisive campaign. The French numbered 115,000, while the allies had only 70,000. Napoleon maintained his position, though at a loss of 12,000 men, against 10,000 of the allies killed and wounded. The allies retreated in good order. Pop. about 5,000.

Lützow, lüt'sō, **F.,** COUNT, **Austrian** author. He has been chamberlain of the Emperor of Austria from 1881. He has published ‘History of Bohemian Literature’ (1899); ‘Prague,’ in ‘Mediæval Towns’ series (1901); etc.

Lützow, Karl von, German historian of art: b. Göttingen 25 Dec. 1832; d. 1897. He assisted Lübke (q.v.) in editing ‘Denkmäler der Kunst’ and in 1867 became professor of the Polytechnicum, Munich. He published ‘Munich Antiques’ (7 vols., 1861–9); ‘Masterpieces of Ecclesiastical Architecture’ (1862); ‘Monuments of Art,’ with Lübke (6th ed. 1892); ‘History of German Copperplate and Wood Engraving’ (1891). He was the founder, in 1866, of the ‘Zeitschrift für bildende Kunst’ and edited it till his death.

Luverne, lū-vėrn', Minn., village, county-seat of Rock County; on the Rock River, and on the Chicago, St. P., M. & O. and the Chicago, R. I. & P. R.R.'s; about 200 miles southwest of Saint Paul, and 30 miles northeast of Sioux Falls, S. Dak. Luverne is situated in an agricultural region in which are granite quarries and fire-clay deposits. The chief industrial establishments are flour-mills, grain elevators, brick and lumber yards, and creameries. Large nurseries are in the vicinity. The trade is principally in flour, granite, grain, live-stock, nursery products and dairy products. Pop. (1910) 2,540.

Luxembourg, François Henri de Montmorency-Bouteville, frän-swä ŏṅ-rē dė môṅmō rŏṅ sē boo-tē-vēl lük-sŏṅ-boor, DUKE OF, marshal of France: b. Paris 8 Jan. 1628; d. Versailles, 4 Jan. 1695. He served when young under the Prince of Condé; in 1662 was made a duke and peer of France, and in 1667 lieutenant-general. In 1672 he commanded during the invasion of Holland; and having gained the battle of Senef in 1674, was created a marshal of France. In the war of France against England, Holland, Spain, and Germany he won the three great battles of Fleurus (1690), Steenkerken (1692), and Neerwinden (1693).

Luxembourg (lŭk'sĕm-bėrg, Fr. lük-sŏṅ-boor) **Palace,** a structure famous for its architecture, art gallery and gardens; situated in Paris, in the Rue de Vaugirard. It was begun in 1616 and completed in 1620; was altered in 1790, and was much enlarged in 1836. At this latter date a magnificent semicircular hall was built for the session of the House of Peers, and later for the Senate. The Senate hall was burned in 1859, but was soon after rebuilt. The name of the palace is derived from the Duke of Piney-Luxembourg, whose mansion once stood on the same site. From 1870 to 1879, the palace was occupied by the Prefecture of the Seine and the Paris municipal council. Since 1879 it has been again occupied by the Senate. It contains a splendid museum of modern art, the most important contemporary collection in the world. The gardens are of the Renaissance order and the most noted in France.

Luxemburg (Fr. lük-sŏṅ-boor, Ger. look'-sem-boorg), **Grand-duchy of,** northwestern Europe, an independent state, bounded north, east and south by Germany, southwest by France, and west by Belgium; greatest length, north to south, 55 miles; greatest breadth, 34 miles; area, 998 square miles. It forms part of the plateau of the Ardennes, and has a rugged and mountainous surface, covered in many parts with heaths and morasses, though in general well wooded. Its drainage belongs almost entirely to the basin of the Moselle. Agriculture is limited in extent by the nature of the surface, but the pastures rear great numbers of cattle, sheep, and horses, the last long in high repute for light cavalry. Considerable quantities of iron are smelted from the ore of the duchy. The inhabitants are mostly of German origin, but French is the language of the educated classes and of business. The people are for the most part Roman Catholics. Pop. (1900) 236,543. Luxemburg, in early times formed a part of Germany. In 1354 it was erected into a duchy by Charles IV. In 1814 it was converted into a grand-duchy under the king of Holland. Though governed by the Dutch kings as grand-dukes it was distinct from the kingdom of Holland; and on the death of Willem III. in 1890 it passed over to Adolf, Duke of Nassau. It is included in the German Customs Union, and formerly was a member of the German Confederation. Capital, Luxemburg.

Luxemburg, the capital of the grand-duchy of the same name, situated 117 miles southeast of Brussels and 34 miles north of Metz. Its natural position is so strong, and the different powers into whose hands it successively fell did so much to extend and improve its means of defense, that it was called «the northern Gibraltar.» From 1839 till 1866 it was garrisoned for the Germanic Confederation by Prussian troops, but in accordance with the Treaty of London (1867) the fortifications were dismantled, the Prussians withdrew their troops, and the neutrality of the duchy was guaranteed by the great European powers. It is divided into a low and a high town. The former lies along the banks of the Alsette. The latter stands 200 feet higher, on a plateau with precipices on three sides, the surrounding ravine being crossed by great viaducts. The town is well built; contains a town-house, government-house, house of deputies, old cathedral church, Athenæum, Roman Catholic seminary for priests, grand-ducal palace (rebuilt 1893–4), a handsome public park, etc. It has manufactures of machinery, leather gloves, breweries, dye-works, etc.; and a considerable trade. Luxemburg is the see of a bishop; and during part of the year is the residence of the leading families of the duchy. Its neighborhood abounds with fine promenades and picturesque features of various kinds.

Luxor, lŭk'sôr or look'sôr, Upper Egypt, a village on the right bank of the Nile, occupying the site of ancient Thebes and containing splendid ruins of that historic metropolis. See THEBES.

Luzac, Jean, zhŏṅ lü-zăk, Dutch philologist and publicist: b. Leyden 1746; d. there 1807. He was of a French Protestant family, was educated for the bar at The Hague, and in 1772 became one of the editors of the 'Leyden Gazette,' a journal of European reputation, controlled since 1738 by his father and uncle. For several years subsequent to 1775 he was its sole editor, in which capacity he became known as a friend or correspondent of Washington, Adams, Jefferson, and many eminent Europeans. He subsequently became Greek professor at the University of Leyden, and in 1795 published an address 'De Socrate Cive,' dedicated to John Adams, whose son, John Quincy Adams, had studied under his direction. During the revolutionary troubles in Holland he was forbidden to lecture on Greek history to his classes; and having refused to obey this injunction, was deprived of his professorship, which was, however, restored to him in 1802 with an increase of salary. Upon being suspended from his professional functions he received a letter from Washington, expressing sympathy in his behalf, and encouraging him to hope for justice. His 'Lectiones Atticæ,' a defense of Socrates, was published in 1809.

Luzenberg, loo'zĕn-bėrg, **Charles Aloysius,** American physician: b. Verona, Italy, 1805; d. 1858. Leaving Italy for the United States in his 14th year, he subsequently received a medical education at the Jefferson Medical College of Philadelphia. He removed to New Orleans in 1829, where he made a reputation for brilliant surgery and was enabled to establish the famous New Orleans Medical School. He visited Paris in 1832, where his reputation had preceded him, and he was elected corresponding member of the Paris Academy. His most important work in Louisiana (where he took up his residence again in 1834) was the founding of the Society of Natural History (1839), and the Louisiana Medico-Chirurgical Society (1843), by which science has been much fostered and promoted in the South.

Luzerne, lū-zėrn, N. Y., village, in Warren County; on the Hudson River, at the mouth of the Sacondaga River; about 20 miles north of Saratoga and 10 miles southwest of Lake George. Lake Luzerne is in the vicinity. The village is situated in an agricultural and lumbering region, and its chief industries are connected with the manufacture of lumber and with farm products. A bridge crossing the Hudson connects Luzerne with Hadley, a station on a branch of the Delaware & Hudson railroad. The cool climate in this region, in summer, the beautiful scenery, and the opportunities for fishing make it a favorite summer resort. Pop. (1910) 1,185.

Luzon, loo-zŏn' (Sp. loo-thōn'), Philippines, the northernmost island of the Philippine archipelago, lying south-southwest of Japan and south-southeast of China. On the north is the Bachi channel, connecting the Pacific Ocean and the China Sea; on the south are the San Bernardino Strait, separating it from Sámar, the channels of the Visayan Sea, and the Tayabas gulf, dividing it from Mindoro.

Topography and Physical Geography.— The island is very irregular in shape, elongated from north to south and southeast, and much wider at the north than at the south. It narrows at lat. 14° 30' where the bay of Manila is, and much more at lat. 14° between Lamón Bay and Tayabas Bay, where an isthmus unites the larger and northwestern part of the island with the smaller southeastern part; it is thus divided into three territorial divisions, Northern Luzón, Central Luzon, and Southern Luzon. The length of Luzon is 283 miles from the north coast to Manila, and from there 225 miles southeast to Babulgun Point; at its widest point near the centre of Northern Luzon it is 138 miles wide; at its narrowest point, the isthmus in lat. 14°, 8 miles wide; area, 43,075 square miles, with dependent islands 44,235 square miles. The mountain system of Luzon consists of three large ranges, the nucleus of which is Caraballo de Baler in the province of Neuva Ecija. The Carabellos Occidentales form the watershed of Northern Luzon, and extend about 150 miles near the western coast and parallel with it; the

Sierra Madre range, starting at Carabello de Baler, extends northeast to Cape Engaño; the Carabellos Sur, starting at the same point, extends south to Banahao, then turns to the southeast and terminates near the straits of San Bernardino. This range has several important branches, one ending on the south side of the bay of Baler. Among the more important single mountains the following may be mentioned: Data (8,333 feet), and Burnay (6,376 feet), of the Carabellos Occidentales; Cana (3,830 feet) of Sierra Madre; and Bulusan and Mayón (7,566 feet) of the southern range. The three last mentioned are volcanos, of which Mayón is the most active. Luzon is well watered; the longest river is the Grande de Cayagán, running nearly the whole length of Northern Luzon; three other large rivers traverse this part of the island, and there are numerous smaller streams. The coast is irregular, and there are numerous bays and excellent ports and harbors, especially on the central and southern coasts.

Commerce and Industries.—There are a number of fine roads in Luzon, which centre at Manila, connecting it with remote points; there is also a railroad from Manila to Dágupan. In 1903 three other railroad lines were proposed, one from Manila to Aparri, following the Pampanga, Magat and Cagayan rivers, another from Manila to Batangas, skirting the west shore of the Bay Lagoon between Muntinlupa and Calamba, and a third from Dágupan to Laoag. All the staple crops of the archipelago grow in abundance, and the chief industries of the island are agriculture, and the development of the products into the advanced forms of manufacture; the mechanical industries are very largely confined to Manila. Luzon is also rich in forests, having all the woods used in building, as well as the gum-producing, medicinal, and dye trees.

Luzon was the first of the Philippine islands to come under the control of the United States; it was the scene of the earliest military operations against the insurgents, and the base of operations for campaigns of occupation of the other islands. The beginning of civil government under the auspices of the United States was coincident with the occupation of Luzon, and the island is now the seat of the authority of civil government as well as of military domination. Civil government has been established throughout the whole island. The provinces into which Luzon is divided are as follows:

Abra.
Albay.
Ambos Camarines (Norte and Sur).
Bataán.
Batangas.
Benguet.
Bulacan.
Cagayan.
Ilocos (Norte and Sur).
Isabela.
Laguna.
Lepanto-Bontoc.
Nueva Ecija.
Nueva Vizcaya.
Pampanga.
Pangasinán.
Rizal.
Sorsogón.
Tárlac.
Tayabas.
Unión.
Zambales.

See PHILIPPINE ISLANDS, and the names of individual provinces.

Lyall, lī'ạl, SIR **Alfred Comyn**, English author and civil servant: b. 1835. He was educated at Eton, entered the Bengal civil service, and was governor of the Northwest Provinces, India, 1882–7. He has published ‹Verses Written in India›; ‹British Dominion in India›; ‹Asiatic Studies›; ‹Life of Warren Hastings.›

Lyall, Edna. See BAYLY, ADA ELLEN.

Lyall, James, American inventor: b. Auchterarder, Scotland, 13 Sept. 1836; d. New York 23 Aug. 1901. He was brought to this country as a child; when old enough worked at loom-making in his father's shop; was a soldier of the 12th New York infantry during the early part of the Civil War; and afterward became a manufacturer of jute and cotton goods and of machines. He designed corset-making machinery and produced the first machine-made corsets ever manufactured. He also invented a waterproof varnish, and in the latter part of the war knapsacks and haversacks waterproofed by his process were largely used in the Union army. The Lyall positive-motion loom, for weaving wide fabrics, was invented by him in 1863. Various other inventions of his are much employed in cotton manufacture. He received many medals and decorations, including the gold medal of honor from the American Institute, bestowed on him in 1869.

Lycan'thropy. See WERE-WOLF.

Lycaon, lī-kā'ȯn, a mythical king of Arcadia, generally represented as a son of Pelasgus by Melibœa, daughter of Oceanus, and described by some as the first civilizer of Arcadia, by others as a barbarian who defied the gods. He became by several wives the father of a great number of sons, so notorious for arrogance and impiety that Jupiter resolved to punish them. Appearing to them at their dwelling in Arcadia disguised as a poor man, they invited him to a repast, at which was served up the flesh of a boy whom they had murdered. The god rejecting the food, transformed Lycaon and all his sons save one into wolves, or according to other accounts destroyed them by a flash of lightning. The flood of Deucalion was said by some to have been a consequence of the crimes of the Lycaonidæ.

Lycaonia, lĭk-ạ-ō'nĭ-ạ, Asia Minor, the name of an ancient division which was bounded north, east, south, southwest and west by Galatia, Cappadocia, Cilicia, Isauria and Phrygia, and is now included in the Turkish province of Caramania. Lycaonia is first mentioned in Xenophon's history of the expedition of the younger Cyrus as belonging to the Persian empire. After its conquest by Alexander and his death, it was attached to the kingdom of Syria, and subsequently came into the possession of Eumenes, king of Pergamus, while the other part was ruled by native chieftains. In the latter half of the 1st century B.C. it was conquered by Amyntas, king of Galatia, with which country it passed on his death to the Romans under Augustus, being annexed to the province of Cappadocia. The inhabitants, according to the Acts of the Apostles, spoke a peculiar dialect. They were warlike and skilled in archery. The principal town was Iconium, now Konieh.

Lyceum, lī-sē'ŭm, an academy in ancient Athens in which Aristotle explained his philosophy. In modern times the name of lyceum has been given to the schools intended to prepare young men for the universities. In France the term is applied particularly to an intermediate classical school. In the United States the term is only applied to the lecture plaform, and is occasionally used as a title for a public ball or assembly room.

Lych-gate. See LICH-GATE.

Lychnis, lĭk'nĭs, a genus of plants of the pink family (*Caryophyllaceæ*) comprising many species well known both as flowering weeds in waste places throughout the northern hemisphere, and as garden ornaments. They have a five-toothed naked calyx, five-clawed petals, ten stamens, and five styles, with flowers generally in terminal corymbs. Ragged Robin, or cuckooflower (*L. flos-cuculi*), a fugitive from Europe, is now common in damp meadows in the eastern part of the United States, and has a pretty flower with rose-colored petals; White campion (*L. alba*) is another species naturalized from Europe; as also are the red campion (*L. dioica*), the corn-cockle (q.v.), and some others. Many foreign species are cultivated in gardens, among which are the scarlet lychnis (*L. chalcedonica*) and the mullein-pink (*L. coronaria*). Two or three species are indigenous to Labrador and the Hudson Bay region.

Lycia, lĭs'ĭ-ạ, Asia Minor, an ancient maritime province, bounded by Caria on the west, Pamphylia on the east, and Pisidia on the north. Its fertility and populousness are attested by the 27 cities mentioned by Pliny, which formed a confederated republic, with a congress which regulated the public concerns, and a president called the Lyciarch. Lycia was colonized by the Greeks at a very early period, and its historical inhabitants were Greeks, though with a mixture of aboriginal blood. They and the Cilicians were the only people west of the Halys whom Crœsus did not conquer, and they were the last who held out against the Persians. Consult Fellows, 'Account of Discoveries in Lycia' (1841).

Lyc'ium, a genus of shrubby and thorny vines of the order *Solanaceæ*, and allied to *Datura* (q.v.), about 75 species of which are scattered throughout the temperate and warm parts of the world. Of the American species none is noteworthy except one naturalized from Europe called box-thorn or matrimony-vine (*L. vulgare*), which bears funnel-form flowers, purplish changing to greenish, and red ovate berries.

Lycomedes, lĭk-ō-mē'dēz, legendary king of the island of Scyros. He was the son of Apollo and Parthenope, and Thetis gave to him the charge of her son Achilles, disguised in woman's apparel, to prevent his going to the Trojan war.

Lycoperdaceæ, lī"kō-pĕr-dā'sē-ē. See FUNGI.

Lycophron, lī'kŏf-rŏn, Greek poet and grammarian: b. Chalcis, Eubœa, 3d century B.C. He lived at Alexandria, under Ptolemy Philadelphus (283–247), whose favor he won by the invention of anagrams. Of all his writings there remains but one tragedy, 'Cassandra' (Alexandra), written in iambics. It has no pretensions to poetical merit, and is but a cumbrous store of learning and obscure allusions. It is, properly speaking, a continued soliloquy, in which Cassandra predicts the fall of Troy, and the fate of all the heroes and heroines who shared its ruin. It affords some information of value respecting antiquities and mythology.

Lycopodiales. See FERNS AND FERN-ALLIES.

Lycopo'dium, the principal genus of club mosses (q.v.), containing many species of the northern hemisphere, of which several belong to the United States. They are low creeping evergreen plants. A common example is the ground-pine (*L. clavatum*), which creeps upon the ground in heathy tracts with long branching stems. *L. rubrum* is a violent cathartic, and has been used successfully in Spanish America in cases of elephantiasis. *L. clavatum* and *L. sclago* excite vomiting. The yellow powder contained in the spore-cases of all the species is very inflammable, and is employed in the manufacture of fireworks, and in the flashing of torches or production of mimic lightning on the theatrical stage. It is also employed to cover pills, so as to prevent them being acted upon by moisture, and is known in England under the name of lycopode or vegetable brimstone, and in Germany as *Blitzmehl* or *Hexenmehl* (lightning meal or witches' meal). Many of the species are prized for their beauty, and are cultivated in hot-houses or fern-cases, where they thrive well.

Lycurgus, lī-kėr'gŭs, Spartan lawgiver; flourished in the 9th century B.C., according to the commonly received traditions. He was the youngest son of the Spartan king Eunomus. His eldest brother, Polydectes, succeeded his father in the government, but died soon after. His wife proposed to Lycurgus to destroy her unborn child by her late husband, if he would share the throne with her. When she gave birth to a son, Charilaus, Lycurgus proclaimed him king, and became his guardian. Being desirous of examining the political constitutions of other lands, Lycurgus left Sparta. On his return the entire community requested him to draw up a constitution for them. He undertook the task. The old constitution was completely remodeled; the highest position in the state was to be shared by two kings, whose powers were counterbalanced by a senate (*gerousia*). The people obtained a voice in public affairs. The native race or Lacedæmonians were confined to the pursuits of trade, commerce, and agriculture; the Helots or slaves to all those menial employments which a freeman would consider as a disgrace, while the Spartans became the warriors of the state. Lycurgus also introduced a redistribution of property. Obtaining from the god at Delphi an approving oracle for his institutions, he exacted a promise from his countrymen not to make any alterations in the laws before his return from a journey he was about to make. He then left Sparta, determined to finish his life in voluntary exile, in order that the Spartans might be bound by their oath to preserve his consitution inviolate for ever. The time and place of his death are unknown.

Lycurgus, one of the ten Attic orators: b. Athens 396 B.C.; d. there 325 B.C. He was a pupil of Plato and of Isocrates. In 343 he was sent with Demosthenes on an embassy to counteract the intrigues of Philip. He won his chief glory as guardian of the public revenue 338–326 B.C. The decree of the Athenians commending his administration of this trust (307 B.C.) is still extant. He was also appointed superintendent of the city, and censor, and in the latter capacity caused his own wife to be fined for violating one of his sumptuary enactments. Of the prosecutions which he conducted, the most celebrated was that against Lysicles, who had commanded the army of Athens at Chæronea; Lysicles was condemned to death. There were 15 orations of his extant in the ages of Plutarch and Photius, but all have since perished except that against Leocrates, and some fragments.

Ly'dekker, Richard, English naturalist: b. 1849. He was educated at Cambridge University and was a member of the staff of the Geological Survey of India 1874–82. He prepared for the British Museum in 1884 a catalogue of the fossil mammalia, reptilia and birds therein, and was in Argentina, 1893–4, to examine the mammals in the La Plata Museum. Among his numerous publications are: 'Phases of Animal Life'; 'Geological History of Mammals'; 'The Deer of All Lands' (1898); 'Wild Oxen, Sheep, and Goats of All Lands, Living and Extinct' (1898); 'Descriptions of South American Fossil Animals.'

Lyd'dite, a high explosive which was adopted by the English government in 1888 for charging its torpedo-shells. Its composition has been varied from time to time, but a typical formula is picric acid 88 per cent, dinitrobenzene 8 per cent, and vaseline 4 per cent. These materials are melted and mixed together in a water-bath, and while in the fused condition they are poured into the shells, where, on cooling, they solidify to a stone-like mass. A central canal is left in the explosive charge in which is placed a detonator containing ammonium picrate by which the charge is exploded. This explosive was practically tested in the Boer war and the results were very disappointing. It is, however, still believed to be an efficient explosive for use against armor. The explosive owes its name to the fact that the first experiments made with it were carried on in the environs of the village of Lydd in England.

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Lydgate, lĭd'gāt, **John,** English monk and poet: b. Lydgate, Suffolk, about 1370; d. Bury St. Edmunds about 1450. After studying at Oxford, and visiting France and Italy, he entered the monastery of Bury St. Edmunds, and established a school for instructing the sons of the aristocracy in versification and composition. He began to write about 1400. His chief works are his 'The Falls of Princes' (1430); 'Story of Thebes' (1420); and 'Historie, Siege, and Destruction of Troye' (1430). His minor poems were published by the Percy Society in 1840. Ritson, in his 'Bibliographia Poetica,' gives a complete catalogue of his works. Lydgate was an admirer of Chaucer, whom he imitated in 'The Story of Thebes,' a Canterbury Tale in ten-syllabled couplets.

Lydia, lĭd'ĭ-a, Asia Minor, the name of an ancient large and fertile country, inhabited along the coast of the Ionian Sea by the Ionians. Toward the south it was separated from Caria by the Mæander (now Meinder); toward the east it was bounded by Phrygia, and on the north by Mysia. It was in early times a kingdom, divided from Persia by the river Halys (now Kizil Irmak). Its original inhabitants were a people called Mæonians, either of Semitic or of Indo-Pelasgic origin. This race was subdued by the Lydians, a Carian tribe. It attained its highest prosperity under the Mermnadæ dynasty, beginning with the semi-mythological Gyges (716 B.C.), and ending with Crœsus (546 B.C.), who was conquered by the Persians under Cyrus. The people were the richest and perhaps the most effeminate in all Asia. They delighted in luxurious garments, costly carpets, precious ointments, and exquisite viands; and a kind of Grecian music called the Lydian. They also laid out beautiful gardens. Their example corrupted the Ionians. The wealth of the Lydians, however, was probably, in a great measure, confined to the kings and chief men. These could fill their coffers with the gold washed down by the Hermus (now Sarabat) and the Pactolus, and that obtained from the mines; and they procured all the necessaries of life by the labor of their slaves. The Lydians are said to have been the first to coin money, and to establish inns; they are credited with the invention of certain musical instruments, the art of dyeing wool (which was afterward carried to such perfection in Miletus), also the art of melting and working ore. At Sardis, the capital of the country, the Grecians, Phrygians, and even the nomadic tribes bartered their goods. There was here a great market for the slave-trade, which furnished the harems of Persia with eunuchs. The great tumuli graves of the ancient Lydian kings are still to be seen near the Gygæan Lake.

Lye, lī, a solution of an alkali; water impregnated with alkaline salt imbibed from the ashes of wood. It is largely used in soap-making.

Lyell, lī'ĕl, **Sir Charles,** English geologist: b. Kinnordy, near Kirriemuir, Forfarshire, Scotland, 14 Nov. 1797; d. London 22 Feb. 1875. He was educated at Oxford, and on leaving Oxford he began to study for the bar and became a barrister. His life was almost wholly given, however, to geology. His first writings on the subject consisted of contributions to the 'Transactions' of the Geological Society, of which he was secretary 1823–6, and president in 1835–6 and 1849–50, and to which he continued to furnish papers throughout his life. His first important work, and the one on which his fame rests, 'The Principles of Geology,' appeared 1830–3. A portion of it subsequently formed the basis of a separate work, 'The Elements of Geology' (1838). In the prosecution of his geological studies Lyell made four visits to North America, in 1841–2, 1845–6, 1852, and 1853. His 'Travels in North America' (1845), and 'Second Visit to the United States' (1849), although mainly devoted to geological topics, contain many entertaining sketches of political and social life and institutions. On the occasion of his first American visit he lectured before the Lowell Institute in Boston and again 1845–6. In 1863 appeared Lyell's last important and most popular work, 'The Antiquity of Man,' containing a summary of all the facts and arguments that could be obtained from geology, archæology, etc., to prove that man had existed upon the earth at a period vastly more remote than usually believed. In 1864 he was president of the British Association. In 1848 he was knighted, and in 1864 was made a baronet. Lyell was a strong supporter of the "uniformitarian" theory of geology — the steady and long-continued action of forces still at work around us — as opposed to those who believe in great cataclysms or convulsions having taken place in the past. Consult 'Life, Letters and Journals of Sir Charles Lyell’ (1881); Geikie, ‘The Founders of Geology’ (1897).

Lygo′dium. See Ferns and Fern-allies.

Lyle, līl, **William,** Scottish-American poet: b. Edinburgh, Scotland, 17 Nov. 1822. He emigrated to the United States and settled in Rochester, N. Y. His poems have had a wide circulation in the United States and Canada. Among his most popular Scotch dialect poems is ‘The Grave of Three Hundred.’ He also wrote several English poems, including ‘Diotima.’ ‘The Martyr Queen’ appeared in 1888.

Lyly, lĭlĭ, **John,** English author: b. about 1554; d. London 30 Nov. 1606. He was graduated from Magdalen College, Oxford, studied also at Cambridge, wrote plays for the children's companies of the Chapel Royal and St. Paul's, London, took side with the bishops in the Mar-Prelate controversy and sat in Parliament for Hindon in 1589, for Aylesbury in 1593 and 1601, and for Appleby in 1597. It is, however, for his ‘Euphues’ (Part I., ‘Euphues, the Anatomy of Wit’ 1579; Part II., ‘Euphues and his England’ 1580) that Lyly is best known. This work is a tedious narrative of the fortunes and interests of a young Athenian, and is remarkable for a prose style that exhibits a uniform and continuous affectation of epigram and antithesis. This fashion of writing, styled ‘Euphuism,’ was much in favor at the court of Elizabeth, influenced numerous writers, and may fairly be assumed to have been ridiculed by Shakespeare. His plays, ‘Alexander and Campaspe’ (1584), ‘Endymion’ (1591), and ‘Midas’ (1592), contain some worthy lyrics.

Lyman, lī′man, **Azel Storrs,** American inventor: b. Potsdam, N. Y., 1815; d. 1885. He was graduated at the Illinois University and had intended to become a Presbyterian clergyman, but deafness prevented the fulfilment of this purpose. Removing to New York he prepared a historical chart subsequently adopted in many schools and colleges, and also contributed to scientific periodicals. His talents for invention having developed themselves he devised important systems of refrigeration, and a new process of ventilation. He also invented a fibre gun for disintegrating wood for paper pulp, which is extensively used, and among his later inventions is the multi-charge cannon known as the Lyman-Haskell gun.

Lyman, Benjamin Smith, American geologist and mining engineer: b. Northampton, Mass., 11 Dec. 1835. He was graduated at Harvard in 1855; taught for several years; in 1859–61 studied at École des Mines, Paris, and then spent a year at the Mining Academy in Freiberg, Germany. In 1858 he became assistant State geologist of Iowa, and in 1870 was employed by the government of India in surveying oil-fields. From 1873 to 1879 he was chief geologist and mining engineer to the Japanese government, and served as assistant State geologist of Pennsylvania, 1877–95. His geological researches have taken him over an unusually wide area of the globe. He has published more than 100 reports and papers on geological subjects, surveying, etc., among which may be mentioned his ‘Preliminary Report on the First Season's Work of the Geological Survey of Yesso’ (1874); ‘A General Report on the Geology of Yesso’ (1877); ‘A General Report on the Punjaub Oil Lands’ (1878); and ‘Geological Survey of Japan.’

Lyman, Chester Smith, American astronomer: b. Manchester, Conn., 13 Jan. 1814; d. New Haven 29 Jan. 1890. In youth he was self-taught in astronomy and other branches of science, making for himself serviceable apparatus. He calculated eclipses 15 years ahead and computed almanacs for 1830–1. He was graduated at Yale in 1837, and studied theology there after a previous course at Union Theological Seminary. After a short pastorate (1843–5) at New Britain, Conn., he went to the Sandwich Islands, where he became instructor at the Royal School. Two years later he was surveying in California. In 1850 he returned to the East and resumed his early study of sciences; in 1858 accepted the professorship of industrial mechanics and physics at Yale; from 1871 to 1884 was professor of astronomy and physics in the Sheffield Scientific School, which he had assisted in organizing; and continued to teach astronomy alone until 1889. He made a number of useful scientific inventions, and was a contributor of papers to the ‘New Englander’ and the ‘American Journal of Science.’

Lyman, Joseph Bardwell, American agriculturist: b. Chester, Mass., 6 Oct. 1829; d. Richmond Hill, L. I., 28 Jan. 1872. In 1867 he became agricultural editor of the New York *World,* was editor of ‘Hearth and Home’ in 1868, and later joined the staff of the *Tribune.* With his wife he wrote ‘The Philosophy of Housekeeping’ (1867). He published: ‘Resources of the Pacific States’ (1865); ‘Women of the War’ (1866); ‘Cotton Culture’ (1867).

Lyman, Phineas, American soldier: b. Durham, Conn., about 1716; d. West Florida, now Mississippi, near Natchez, 10 Sept. 1774. He was graduated at Yale in 1738, and subsequently practised law in Suffield. In 1755, being commander-in-chief of the Connecticut militia, he served with Sir William Johnson at the battle of Lake George, and, after his commander had been disabled, conducted the engagement to a prosperous conclusion. He was present at the attack upon Ticonderoga by Abercrombie, and at the capture of Crown Point and the surrender of Montreal; and in 1762 commanded the provincial troops in the expedition against Havana. Subsequently he passed many years in England in efforts to procure a grant of land on the Mississippi for the purpose of establishing a colony, and in 1775 embarked with his eldest son and some others for the country in question. The emigrants who followed him encountered many misfortunes, and after the subjugation of the country by the Spaniards in 1781–2 were obliged to take refuge in Savannah.

Lyman, Theodore, American philanthropist: b. Boston 20 Feb. 1792; d. Brookline, Mass., 18 July 1849. He was graduated from Harvard in 1810, studied at the University of Edinburgh in 1812–14, was for a time aide-de-camp to the governor of Massachusetts, in 1823–7 commanded the Boston brigade of the State militia with rank of brigadier-general, was a representative in the State legislature in 1821–4 and 1825, and State senator in 1824. In 1834–5 he was mayor of Boston; and on 21 Oct. 1835, at the risk of his own life, rescued William Lloyd Garrison from the "gentlemanly mob" that had vowed to bring the Abolitionist to the tar-kettle before dark. From 1835 he devoted himself to philanthropic work, and in 1844 removed to Brookline, Mass. In 1840–6 he was president of the Boston Farm-school. To this institution he gave $10,000; to the Massachusetts Horticultural Society, of which he was a life-member, $10,000; and to the State reform-school, now the Lyman school, at Westboro, $72,500. He wrote: ‘Three Weeks in Paris’ (1814); ‘The Political State of Italy’ (1820); ‘The Hartford Convention’ (1823); ‘The Diplomacy of the United States with Foreign Nations’ (1828)

Lyman, Theodore, American naturalist: b. Waltham, Mass., 23 Aug. 1833; d. Nahant, Mass., 9 Sept. 1897. He was a son of Theodore Lyman (1792–1849) (q.v.). He was graduated from Harvard in 1855, from the Lawrence Scientific School in 1858, and was assistant in zoology at the Museum of Comparative Zoology. In 1863–5 was volunteer aide on the staff of General Meade, with rank of lieutenant-colonel. Having been mustered out on 20 April 1865, he was fish commissioner for Massachusetts in 1865–82, and in that capacity made the first experiments undertaken by any State of the Union for the cultivation and protection of food-fishes. In 1883–5 he served in Congress as an Independent representative. He was also president of the Boston Farm-school, a member of the National Academy of Sciences (from 1872), and a trustee of the Peabody education fund. He donated $10,000 to Harvard and his library of scientific works to the Museum of Comparative Zoology. Among his publications are: ‘Illustrated Catalogue of the Ophiuridæ and Astrophytidæ in the Museum of Comparative Zoology’ (1865), with a ‘Supplement’ (1871); ‘Old and New Ophiuridæ and Astrophytidæ’ (1869); ‘Papers Relating to the Garrison Mob’ (1870); ‘Prodrome of the Ophiuridæ and Astrophytidæ of the Challenger Expedition’ (1878–9); and ‘Report on the Ophiuridæ Dredged by H. M. S. Challenger during the Years 1873–6’ (1882).

Lymph, the fluid contained in the lymphatic glands and in the lacteals (q.v.). It is elaborated primarily by the assimilation of food, and is also obtained from the blood and tissues, the system of vessels in which it is contained ramifying throughout the bodies of vertebrates. The clearest and simplest view of the nature and functions of the lymphatic vessels is that which considers them as forming a connecting-link between the digestive and circulatory systems. The matters absorbed from the alimentary canal and from the blood and tissues are converted in the lymphatic glands into lymph, which supplies initial and essential elements of the blood. The lymphatic system, concerned in absorption, is also called the absorbent system. None of the invertebrates have such a defined set of vessels; in the lower animals matters pass from the digestive system into the blood-system directly and without the intervention of any absorbent vessels. The lymphatic vessels constitute a distinctive character of the highest sub-kingdom of animals. Fresh supplies of nutritive matter are poured from the lymphatic system into the current of circulation, but it is difficult, if not impossible, to determine where the function of circulation ends and that of absorption begins.

The lymph as it exists in the lymphatic vessels is a colorless, transparent fluid, odorless, with a slightly saline taste and an alkaline reaction. When microscopically examined, it is seen to be a clear plasma containing corpuscles. It resembles blood in being an alkaline fluid and in that it coagulates or clots by the separation of the fibrinous part of the plasma; but it differs from blood in that its corpuscles are nearly all colorless, and because its solid matters are present in very small proportions. The lymph-corpuscles, when passed into the current of the blood, by a simple change of medium become the white blood-corpuscles, and, when partially altered they give origin to red corpuscles. The lacteals absorb the chyle directly from the alimentary canal, and pour it, as rudimental blood, into the current of the circulation. Then from the body generally the ordinary lymphatic vessels bring the lymph, which is further elaborated in the lymphatic glands, and pour it into the current of the blood. The actual termination of the lymphatic vessels is in the large veins in the neighborhood of the heart. The lymphatic circulation may thus be regarded as corresponding in its general direction to the course of the venous blood.

The lymphatic vessels resemble small veins in their general structure. They are provided with valves permitting the flow of the lymph only toward the large veins near the heart and into which the lymph is poured. The only structures in which lymphatic vessels do not exist are the non-vascular parts, such as the hair, nails, outer skin, and cartilaginous tissues. The flow of lymph toward the heart is induced partly by the general pressure and action of the muscles of the body, the valvular structure aiding its propulsion as in the veins; and to this, as well as to the absorptive power, must be added the action of the contractile muscular fibres of the lymph-vessels themselves.

The fluid employed in vaccination (q.v.) is also called lymph, of which two varieties are distinguished, human and bovine. The term has likewise been applied to various serums made from bacterial cultures for preventive or curative use in certain diseases, especially to those serums known as antitoxins (q.v.). See IMMUNITY; KOCH, ROBERT; SERUM, THERAPY; TUBERCULOSIS.

Lymphatic Glands, small organs, round and smooth and comparatively solid, which form part of the lymphatic system in vertebrates. (See LACTEALS; LYMPH.) Into these, sooner or later in their course, the other lymphatic vessels run, and from them emerge again. The lymphatic glands are highly important structures, since only after passing through them does the lymph contain, in any abundance, lymph-corpuscles. In size the glands may be compared to small almonds, and they are generally arranged in groups. Each gland is entered by a number of afferent vessels which bring lymph to it, while those (efferent vessels) which leave the gland carry lymph away from it. Externally a lymphatic gland presents an envelope of connective tissue, from which the stroma, consisting of a fibrous framework of processes, is prolonged into the interior of the gland. Within the stroma the essential gland-structure is contained. Within the stroma also, as well as within the softer portions or pulp contained in the meshes of the fibrous network, minute blood-vessels are distributed. Corpuscles are added to the lymph in the glands, while in the composition of its fluid it undergoes further elaboration. The lymphatic trunks of the greater part of the body finally pour their contents into the thoracic duct, a small tube which opens into the current of the blood at the point of junction of the internal jugular and subclavian veins of the left side of the body. On the right side of the body is a still smaller duct which receives the contents of the lymphatics of the right half of the chest, the right arm, and right side of the head and neck; and this smaller lymphatic channel or right lymphatic duct opens into the angle formed by the junction of the right jugular and subclavian veins, similarly to its larger neighbor of the left side. The thoracic duct begins in the upper part of the abdomen, and runs up in front of the spine to the root of the neck, where it opens into the great veins. The receptaculum chyli, or cistern of the chyle, is the dilation at the commencement of the thoracic duct in the abdomen, which receives the contents of the lacteals or intestinal lymphatics. The orifices by which the thoracic duct and right lymphatic duct open into their respective great veins are guarded by valves which permit the lymph to flow from the ducts into the veins, but prevent the flow of blood into the ducts.

The spleen has been considered by physiologists to be merely a ductless lymphatic gland of large size, since it appears to be concerned in the elaboration of the blood, and also to be a place of disintegration of the red corpuscles and a manufactory of the white corpuscles of the blood. And the thymus, another ductless gland, has also been supposed to be connected with the function of blood-elaboration, and thus to be associated with the lymphatic system.

Lynch, Anne Charlotte. See BOTTA, ANNE CHARLOTTE.

Lynch, Arthur, Irish journalist and author: b. Smythesdale, Ballarat, Victoria, Australia, 1861. He was educated at Melbourne University and the University of Berlin. practised as an engineer, lectured on engineering and scientific subjects at Melbourne, was for a time a journalist in London, was a war correspondent in Ashanti, and twice visited America. During the second Boer war he was colonel in the Irish brigade No. 2 of the Transvaal forces; and upon his landing in Great Britain subsequent to the war was brought to trial for high treason. He was sentenced to death; but this sentence was afterward commuted to life imprisonment. Lynch was elected M. P. for Galway in 1901. Among his books are: ‹Modern Authors› (1891); ‹Approaches› (1892); ‹Our Poets› (1895); ‹Religio Athletæ› (1895); ‹Human Documents› (1896).

Lynch, Charles, American planter and soldier: b. 1736; d. 1796. He lived on the Staunton River in Virginia, and in support of the revolutionary government in that region during the early part of the war with Great Britain, joined Robert Adams and Thomas Calloway in the punishment and exile of Tories. A frequent method, so says tradition, was to suspend the disaffected by their thumbs until they were willing to exclaim «Liberty forever!» The summary acts of this self-appointed court are generally accepted as the origin of the term lynch-law (from «Lynch's Law»). But whereas the expression is now used almost exclusively of punishment by death without legal authority, it does not appear that Lynch ever exacted the death penalty.

Lynch, George, English author and journalist: b. Cork, Ireland, 27 March 1868. He went on exploring expeditions in Western Australia and in the Pacific islands; in 1898 he was war correspondent for the London *Daily Chronicle* in the Spanish-American War. He then went to Africa as correspondent for the ‹Illustrated London News› during the Boer war, and was wounded at the battle of Reitfontein. He was at Ladysmith during the first part of the siege, and, on attempting to go from there to join General Buller's forces, was captured by the Boers and kept a prisoner for a month. Shortly after obtaining his freedom he returned to England. He was war correspondent for the *Daily Express* and the *Sphere* in the China campaign for the relief of Peking, and later visited southern China and Japan. He has also been special correspondent for the London *Daily Mail* in the United States. He has written ‹The War of the Civilisations›; ‹Realities›; and ‹The Bare Truth about War and Other Things.›

Lynch, Hannah, English novelist: d. January 1904. She was the Paris correspondent of ‹The Academy› and published ‹Prince of the Glades›; ‹George Meredith: a Study›; ‹Dr. Vermont's Fantasy›; An Odd Experiment›; ‹Toledo› in ‹Mediæval Towns› series; ‹French Life in Town and Country›; ‹Autobiography of a Child›; etc. She also translated the dramas of Echegaray (q.v.) into English.

Lynch, John Joseph, Canadian Roman Catholic prelate: b. Ireland 1816. He was educated at Dublin and Paris, and ordained to the priesthood in 1843. Three years later he came to the United States, was first engaged in missionary work at Houston, Texas, and then became president of the Lazarist College of Saint Mary the Barren in Missouri. He next went to Canada, where he founded the Seminary of Our Lady of Angels, and in 1860 was appointed bishop of Toronto. He was later made archbishop of Toronto and Metropolitan of Ontario; in 1869 he was a member of the Vatican Council.

Lynch, Patricio, Chilean naval and military officer: b. Santiago Chile, 1824; d. at sea May 1886. He was educated at the Chilean Naval Academy; entered the English navy in 1840 and took part in the Anglo-Chinese War; in 1847 he re-entered the Chilean navy and served during the war against Spain. In 1879–80 he commanded a military and naval expedition against Peru, and ravaged the northern part of that state, destroying a large amount of property. He also took part in the attack against Lima, and was made commander-in-chief of the Chilean army; in the city of Lima he strictly observed martial law, suppressed the Peruvian government, and took Calderon, the provisional president, prisoner, though this act called forth a protest from the United States minister. In 1883 he evacuated the city, having placed Iglesias at the head of affairs. He was made vice-admiral of the navy, and in 1884 sent as minister to Spain. He died on his homeward voyage two years later.

Lynch, Thomas, Jr., American patriot, one of the signers of the Declaration of Independence: b. Prince George's parish, S. C., 5

Aug. 1749; perished at sea in the latter part of 1779. He was educated at Eton and the university of Cambridge, and was subsequently admitted a student in the Temple, London. In 1772 he returned to South Carolina, and at the outbreak of hostilities in 1775 was appointed a captain in the first regiment of provincial regulars raised by South Carolina. Being unanimously chosen by the provincial assembly to succeed his father as a member of Congress, he took his seat in that body in 1776, but in a few months was compelled by ill health to retire from active political life. One of his last public acts was to affix his signature to the Declaration of Independence. In the latter part of 1779, as the only means of saving his life, he sailed for St. Eustatius, West Indies, intending to find there a neutral vessel which would convey him to France. The ship in which he sailed was never heard from and is supposed to have been lost in a storm.

Lynch Law, or Judge Lynch, a name for irregular punishment, especially capital, inflicted by private individuals independently of the legal authorities. The origin of the term is doubtful; by some it is said to be from James Lynch Fitz-Stephen, warden of Galway, Ireland, who, about 1526, sentenced his son to death for murder, and to prevent a rescue by a mob, executed him with his own hands without due process of law. By others the term is said to have had its origin in the State of Virginia, where a farmer of the name of Charles Lynch (q.v.) took his own way of obtaining redress for a theft by catching the culprit, tying him to a tree, and flogging him. This mode of administering justice has always prevailed more or less in every country in times of great popular excitement, and is necessarily resorted to in newly settled territories, where the power of the civil government is not fully established. As early as 1768, in the United States the terms «regulating,» «regulation,» and «regulator» were in use in the Carolinas; illegal whippings were at that time inflicted by the Regulators, and it is claimed that a meeting of the Regulators took place at Lynch's Creek. Whether there is any historical connection between the Regulators of the Carolinas and the Regulators who flourished along the western frontiers where lynch law was well known, in and after 1819, is one of the many obscure points in the early history of lynch law which await elucidation. At first in the United States, «lynch law» was not mob law, as it is now understood. It was orderly, methodical, and fair in its practices, and was strongly opposed to violence or mob rule. Its distinctive feature was simply that its decrees and findings were executed sternly and swiftly on the spot where they had been decided upon. This was true of the conditions in California in 1849 when Judge Lynch held frequent court, and hundreds of culprits were executed between 1849 and 1860, in an orderly manner, with nothing of the mob violence or excitement common in recent years. During the Civil War and afterward, lynching was practised in the Southern States at the instigation of the Ku Klux Klan (q.v.). From 1870 it became an unwritten law in the South to lynch by mob rule every negro charged with rape or assault, or with the murder of a white person. Gradually this practice spread to Northern States, and negroes were not only «lynched,» or hung, but were burned at the stake in Indiana, Illinois, Ohio, and other States. In 1892, there were 241 lynchings in the United States, and of this number 162 were negroes. During 1902 there were 100 lynchings in this country. Rarely is there conviction or punishment of persons who participate in lynchings, owing largely to the sympathy of jurors for the accused. In Kansas and Indiana laws have been passed providing for the suspension from office of sheriffs who fail to protect prisoners from the violence of the mob. The best remedy for lynch law is prompt action by the courts and the prompt execution of sentence after a culprit has been convicted.

Lynchburg, Va., city, Campbell County; on the James River, and on the Norfolk & W., the Southern, and the Chesapeake & O. R.R.'s; about 125 miles west by south of Richmond. The city is situated in a river valley which forms a pass through the mountains. The irregularity of the surface upon which stands the city, the hills, the numerous terraces, the many trees along the streets, the well-built, handsome houses with neatly kept grounds, all make the place most attractive.

History.— Lynchburg was founded in 1786 by John Lynch, but it was not incorporated until 1823. It was early in the 19th century, as now, a distributing centre for places above on the river. and for many settlements and towns south of the James. The Confederates used it as a supply depot during the Civil War. On 18 June 1864 Gen. Hunter, of the Federal army, attacked the city, but was defeated.

Manufactures, etc.— The chief manufactures are iron and brass products, tobacco, cotton goods, plows, wagons, shoes, dyes, bark extract, hardware, flour, and lumber. It has extensive tobacco interests, as a manufacturing and jobbing centre being among the seven leading shoe jobbing centres of the Union. The trade is principally in tobacco, raw and manufactured; coal, granite, and its own manufactures. Lynchburg is the seat of Randolph-Macon Woman's College, and it has four hospitals, and the Miller Female Orphan Asylum. Granite quarries are near by, and large coal fields and iron ore are in the neighboring counties. The river furnishes extensive water-power, which aids in the development of the manufacturing interests of the city.

Government, etc.— The government of the city is vested in a mayor, who holds office two years, and a council. The city treasurer, clerk of the courts, and commissioner of revenue are chosen by popular election, and the other officers are appointed. The waterworks plant is owned and operated by the city. Pop. (1900) 18,891; (1910) 29,494. Consult Cabell, 'Sketches and Recollections of Lynchburg.'

John A. Faulkner,
Secretary Lynchburg Board of Trade.

Lynde, Francis, American novelist: b. Lewiston, N. Y., 12 Nov. 1856. After many years in the railway service in various capacities, he turned to literature in 1893 and besides contributions to magazines, has published: 'The Helpers: a novel of Colorado Life' (1899); 'A Private Chivalry' (1900).

Lyndhurst, lĭnd'hėrst, **John Singleton Copley,** Baron, English lawyer and statesman: b.

Boston 21 May 1772; d. London 12 Oct. 1863. His father (q.v.) was the well-known painter of the same name. He was taken to England in early infancy, his parents having gone to reside in London. He was educated at the University of Cambridge, became a fellow of Trinity College, traveled in the United States, was called to the bar at Lincoln's Inn in 1804, and soon gained a high position. In 1817 he ably defended Watson and Thistlewood for high treason, and obtained their acquittal. In 1818 he entered Parliament for Yarmouth, Isle of Wight, which he soon exchanged for Ashburton. In 1819 he became solicitor-general and was knighted. He conducted the prosecution in the trial of Queen Caroline. In 1824 he succeeded to the post of attorney-general, in 1826 was elected for Cambridge, and became master of the rolls. He succeeded Lord Eldon as chancellor in 1827, which post he retained until 1830, and was raised to the peerage as Baron Lyndhurst. In March 1829, he delivered a great speech against Catholic emancipation. During the ministry of Earl Grey (1830–4) he was chief baron of the exchequer. He was a formidable opponent of the reform bill, and in 1834 became a second time chancellor, but in 1835 retired with the Peel ministry. Lyndhurst's speeches and annual reviews of the session contributed greatly to the return to power of the Conservatives in 1841, on which occasion he was a third time raised to the woolsack. He retired in 1846, from which time he took little part in home politics, confining his attention more to matters of foreign policy. For a long time he was virtually the Tory leader in the upper house. Brougham said: "Lyndhurst was so immeasurably superior to his contemporaries . . . , that he might well be pardoned for looking down rather than praising." Consult: Sir Theodore Martin's 'Life' (1883).

Lyne, līn, **Joseph Leycester**, commonly known as "Father Ignatius," or "Ignatius of Jesus," English clergyman: b. London, 23 Nov. 1837; d. 16 Oct. 1908. After taking deacon's orders, and doing mission work in London, he conceived the idea of reviving the Benedictine rule in a modern monastic foundation. With this view he built Llanthony Abbey in Wales, where he was joined by a few enthusiasts, though his movement has made no progress at all commensurate with his programme. He is a striking preacher and has visited the United States as a missioner. Among his published works are: 'The Catholic Church of England' (1864); 'Brother Placidus' (1870); 'Leonard Morris, or the Benedictine Monk' (1871); 'Mission Sermons and Orations' (1886); 'Tales of the Monastery.'

Lynn, lĭn, Mass., city, in Essex County; on Massachusetts Bay, and on the Boston & M., the Boston, Revere Beach & L. R.R.'s; about 10 miles northeast of Boston, and five miles southwest of Salem. Area, nearly 12 square miles. Lynn was first settled in 1629 by Edmund and Francis Ingalls and for a time was called Saugus. It was incorporated in 1630 and chartered as a city in 1850. The city includes what were several independent villages: Glenmere, Highlands, East Lynn, West Lynn, Linwood, Lynmere, and Wyoma. The Lynn harbor is shallow, but it is considered safe. The three-mile shore-line adds to its attractions. The city is noted for its shoe factories. The annual amount of shoe business is $40,000,000; and the number of persons employed, 25,000. The General Electric Company's annual business amounts to over $40,000,000, and the number of employees is about 20,000, over 6,000 of whom are in Lynn. The chief manufactures are shoes, cut leather, shoe machinery, electrical supplies, meters, arc lamps, morocco, and patent medicines. There are 11 banks, six national, three savings banks, and two trust company banks. The combined capital is $1,600,000. The total deposits in the savings banks amount to $10,000,000; total in the national and trust company banks, $6,000,000. The city has the following churches: Methodist, 12; Baptist, 7; Congregationalist, 7; Roman Catholic, 4; Protestant Episcopal, 2; Universalist, 2; Friends, 2; Presbyterian, Adventist, Wesley Evangelical, Pentecostal, Swedish, Lutheran, and Hebrew, each one church.

Some of the principal buildings are Lynn Public Library, which has about 65,000 volumes; Lynn Hospital, the city hall, Lynn Home for Aged Women, and an orphanage. There are two high schools, 101 grammar schools, 120 primary schools, four large parish schools, containing primary, grammar and high school departments.

The annual expenditure for municipal maintenance and operation is about $1,348,000; the chief items are, schools, about $245,000; for poor, sick, homeless, and other charities, $106,000; for police department, $84,500; for fire department, $96,000; for waterworks, $64,500; for city lighting, $56,000. The waterworks plant opened in 1870, and costing about $2,500,000, is owned and operated by the city.

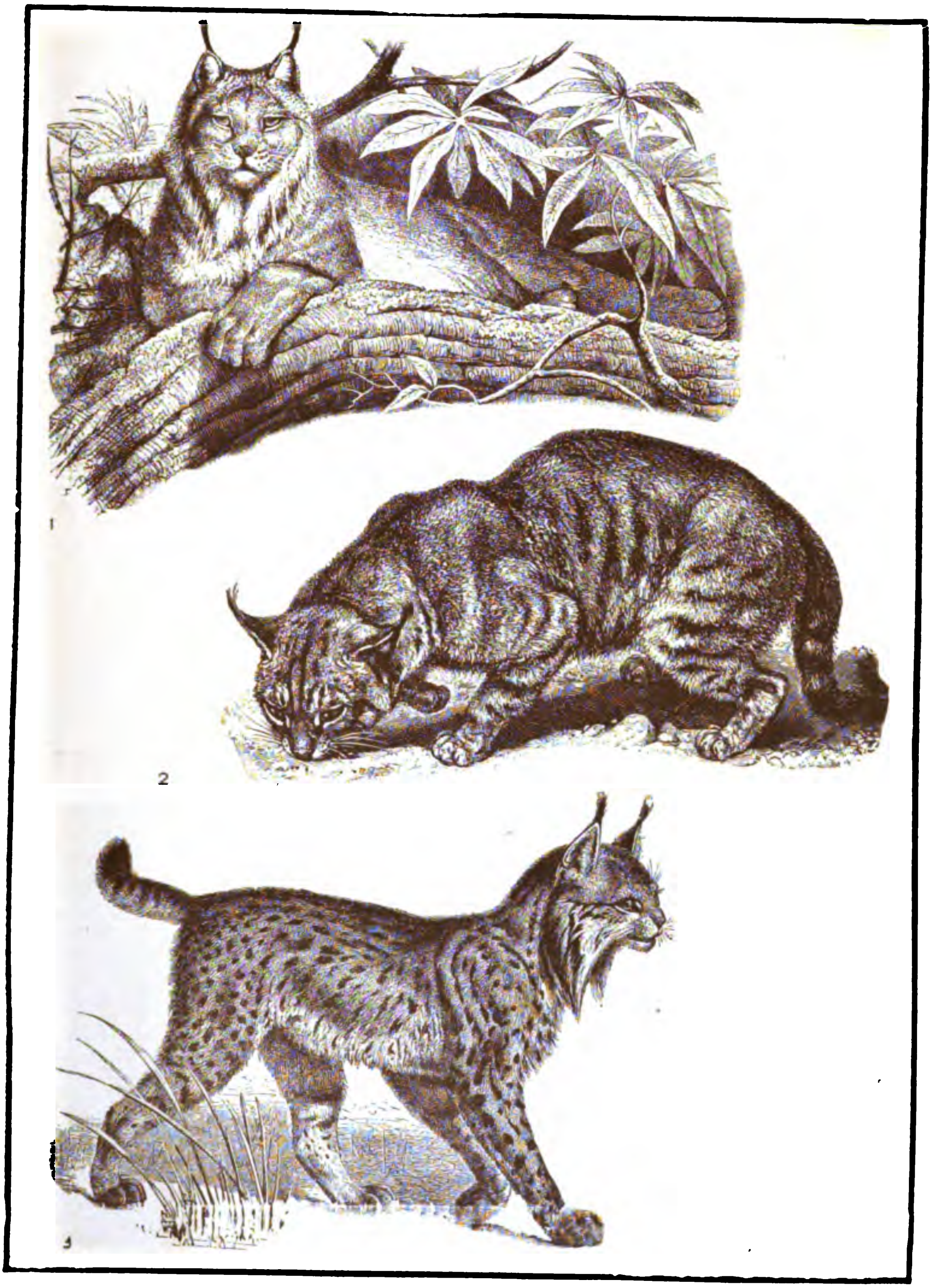
The government of Lynn is conducted on the commission plan, there being in August, 1911, only four cities so governed in Massachusetts, the others being Gloucester, Haverhill and Taunton. Pop. (1910) 89,336. Consult: Newhall, 'History of Lynn, Mass.'

W. R. Hastings.

Lynx, a wildcat, distinguished from the larger members of the family *Felidæ* chiefly by the shortness of the tail, and the presence of a pencil-like arrangement of hairs at the tips of the ears. It was long customary to regard these cats as constituting a separate genus *Lynx*, to which the North American wildcats, the caracal, and some others, were assigned, but modern zoologists include them with the general genus *Felis*. See Wildcat. The fur known to trade as "lynx" is furnished by the Canadian lynx, and is described as of a light-brown color, with a light silvery top on the back, that on the under part long, soft, and spotted; about 30,000 to 80,000 are exported yearly from the Dominion of Canada, California, and Alaska to Liverpool, besides what is consumed in domestic trade.

Lyon, lī'ŏn, **David Gordon**, American Assyriologist: b. Benton, Ala., 24 May 1852. He was graduated from Howard College, Ala., and from the University of Leipsic in 1882, and since the latter date has been Hollis professor of divinity at Harvard. He was recording secretary of the American Oriental Society, 1886–95, and corresponding secretary of the Society of Biblical Literature, 1894–9. He has published 'Keilschrifttexte Sargons, König von

LYNXES.



1. Canada Lynx. 2. European Lynx. 3. Chaus.

Assyrien› (1883); ‹An Assyrian Manual› (1886).

Lyon, Mary, American educator: b. Buckland, Mass., 28 Feb. 1797; d. South Hadley, Mass., 5 March 1849. She began teaching at 18, and later studied at the Sanderson Academy, Ashfield, and at the Byfield Academy, near Newburyport, continuing to teach at intervals. In 1821 she began teaching at the Sanderson Academy, and in 1824 became associate principal of the Adams Female Academy at Londonderry, N. H. In 1828, with the principal of this school, she moved to Ipswich, Mass., where they were followed by a number of their pupils, and established a seminary of which Miss Lyon had practically the entire charge for several years. The establishment of a seminary for girls, embodying the same principles of education as the Ipswich school, and at the same time offering its advantages at a low price, became the main purpose of her life; and in 1834 she resigned her position at Ipswich, and, amid great discouragements, undertook the work of founding such a seminary. Aided to some extent by clergymen and others, she succeeded in obtaining contributions, and on 8 Nov. 1837 a part of the buildings having been completed, the school was opened in South Hadley with about 80 pupils, under the name of the Mount Holyoke Female Seminary. She was president of this school for 12 years, during which time it was enlarged, and gained a national reputation for its high intellectual and moral standard. (See MOUNT HOLYOKE COLLEGE.) She wrote ‹Tendencies of the Principles embraced and the System adopted in the Mount Holyoke Female Seminary› (1840), and the ‹Missionary Offering› (1843). Consult: Hitchcock, ‹Life and Labors of Mary Lyon.›

Lyon, Matthew, American politician: b. Wicklow County, Ireland, 1746; d. Spadra Bluff, Ark., 1 Aug. 1822. He went to New York in 1755, and, being too poor to pay for his passage, was bound out by the captain of the ship to a farmer in Connecticut, in whose service he remained a number of years. Subsequently he became a citizen of Vermont, and in July 1776 was commissioned as lieutenant in one of the companies of «Green Mountain boys.» He served later as commissary-general, and eventually rose to the rank of colonel of militia. He was one of the founders of Fairhaven (1783), where he engaged in paper-making, iron casting, and other occupations, and at one time edited a newspaper of an ultra democratic character, entitled ‹The Scourge of Aristocracy and Repository of Important Political Truth,› of which the types and paper were manufactured by himself. Becoming an active political leader, he was elected in 1797 to Congress by the Anti-Federal Party. In October 1798 he was convicted of a libel on President Adams, and imprisoned for four months, a fine of $1,000 which had also been imposed upon him being paid by his friends. An attempt to expel him from Congress as a convicted felon failed for want of a two thirds vote. During this congressional term he had a violent altercation on the floor of the House with Mr. Griswold of Connecticut, ending in blows; but the motion to expel them was defeated. In 1799, while a prisoner, he was re-elected to Congress from Vermont. After the expiration of his term he removed to Kentucky, where at the next Congressional election (1803) he was returned to the House, of which he continued a member until 1811. Subsequently he held the office of United States factor for the Cherokee Indians by the appointment of President Monroe; and removed to Arkansas, of which he was the territorial delegate-elect to Congress at the time of his death. Though rough and impetuous in manner, he was an able debater, and to the end of his life continued a man of active business habits.

Lyon, Nathaniel, American soldier: b. Ashford, Conn., 14 July 1818; d. Wilson's Creek, Mo., 7 Aug. 1861. He was graduated from West Point in 1841; served in the Mexican War, 1846-7, being present at the siege of Vera Cruz, and the assault on the City of Mexico; and was on duty in Kansas during the Free State agitation. In February 1861 he was assigned to St. Louis, Mo., where he had charge of the arsenal; he was most active and efficient in the Union cause, organized the Home Guard, and on 10 June 1861 captured Camp Jackson, a rendezvous of the secessionists. Soon afterward he was made brigadier-general of volunteers, and given command of the department. He refused all compromise with Governor Jackson, who sympathized with the secessionists, and in June occupied Jefferson City, the capital of the State, and defeated the Governor's troops at Boonville on the 17th. He then went to Springfield, whence he advanced on 1 August to meet a part of the Confederate army, which was advancing into Missouri under McCulloch; he defeated them at Dug Spring, and returned to Springfield. But the Confederate forces were soon increased by the arrival of the troops under Price, and General Lyon was opposed by an army considerably greater than his own. Unwilling to surrender southwestern Missouri without a struggle, he decided to risk a battle, and accordingly advanced from Springfield to Wilson's Creek, where his troops were defeated, and he himself killed, after a gallant fight. He bequeathed nearly all his property, about $30,000, to the government to aid in the preservation of the Union. In 1862 a collection of his letters in favor of the Republican party and the election of Lincoln (1860) was published under the title ‹The Last Political Writings of General Nathaniel Lyon.› Consult ‹Life› by Woodward; Peckham, ‹General Nathaniel Lyon and Missouri in 1861›; and Churchill's novel, ‹The Crisis.›

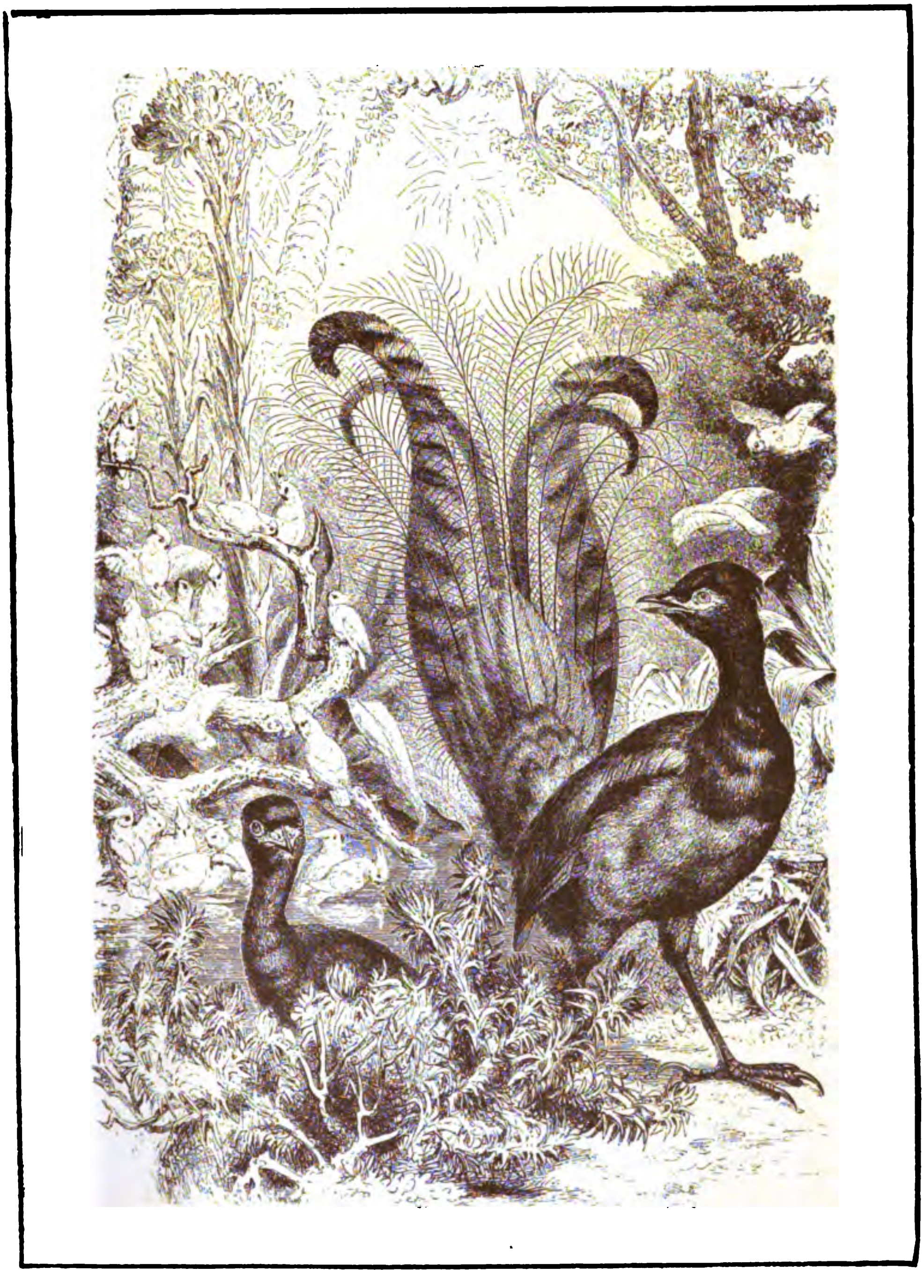
Lyons, lī'ȯnz, or **Lyon**, lē-ôṅ, France, the capital of the department of the Rhône, 311 miles by rail southeast of Paris, and 170 miles north of Marseilles, is the second city of industrial importance, and the third in point of population in the country. It is situated at the confluence of the Saône and Rhône, the central business section being on the tongue of land that projects between the rivers to their junction, and extends northward to the hill of La Croix Rousse; while the ancient mediæval town is on the steep slopes of the Fourvières hill, rising from the west bank of the Saône, and the modern industrial suburb of La Guillotière, with its numerous factories, is on the east bank of the Rhône. Thirteen bridges span the Saône at this point, varying from 250 to 450 feet wide, and nine bridges the Rhône, over 600 feet wide. A series of detached forts crown different heights within a circuit of

43 miles, making Lyons, with its extensive barracks and considerable garrison, a defensive position of great strategic importance. The older quarters of the town are crowded, dirty and unhealthful, with narrow, irregular streets, lined by tall, ungainly buildings. The best parts are the 13 miles of magnificent quays, built since the 18th century as a protection against the periodical river floods, and now laid out with finely planted walks, stately mansions, municipal buildings, railroad depots, capacious warehouses, etc. Among the notable squares and open places are the Place des Terreaux, facing which stands the Hôtel de Ville, and the large and handsome Place Bellecour, the fashionable promenade. The chief public edifices are more remarkable for their antiquity than for the beauty of their architecture. The cathedral of St. John on the slope of the Fourvières, on the right bank of the Saône, is in the Gothic style of the 12th century, and has four towers, two of which flank the west front, while the other two, shorter but more massive, form the transepts. Higher up the slope is the modern church of Notre Dame, an imposing composite edifice occupying the site of the *Forum Vetus* built by Trajan. Beside it is a tower or Belvedere 680 feet above the Saône. On the other side of the Fourvières is the church of St. Irenæus, the second bishop of Lyons. The church itself is an uninteresting modern structure, but it stands on the grave of the martyred bishop, and has beneath it the reputed crypt in which Polycarp preached, and 19,000 Christians at a later period were massacred by orders of Septimius Severus, 202 A.D. A little above the cathedral is the Palais de Justice, and lower down on the opposite bank of the Saône is the church of the Abbey of Ainay, beneath whose sacristy, and penetrating below the bed of the river, are dungeons without light or air, in which many of the early Christians were immured previous to martyrdom. Other noteworthy churches are the Church of St. Nizier, of the 14th century, one of the largest in the town; that of St. Bonaventure, the patron saint of Lyons; and the Church of the Chartreux, surmounted by a superb dome seen from all quarters of the city. The archiepiscopal palace, situated near the cathedral, is a large edifice of no architectural merit. The Hôtel de Ville is considered one of the finest edifices of the kind in France. It is an isolated square, and is surmounted by a dome 164 feet high. The public library, occupying part of the buildings of the college on the Quai de Retz, is the best provincial collection in France. The Palais des Arts, facing the Place des Terreaux, is a fine majestic edifice. It contains a picture-gallery, a cabinet of medals, a gallery for statues, and another for ancient stuccoes, a depot of mechanical inventions for the fabrication of silks, with a library attached; a free school of design, and a large hall used as the exchange.

The chief educational establishments are the college, or university, occupying a fine modern building and attended by over 2,000 students in the different faculties; the Martinière, a great school of science and the industrial arts with 500 students; a free Catholic university; various institutions of a special character, such as schools of chemistry and chemical industry, schools of design, of commerce, of weaving; a celebrated veterinary school, the botanic garden, etc. Charitable establishments are large and numerous. The most important are the Hôtel-Dieu, the Maison de la Charité, the Mont de Piété, occupying the Manécanterie or deanery attached to the cathedral; and the Hospice de l'Antiquaille, on the site of the ancient Roman palace or prætorium, now used partly as a lunatic and partly as a Magdalen asylum, and general penitentiary. There are several prisons — the New Prison, an extensive building, well arranged; the Maison des Recluses, now employed as a military prison; and the prison of Roanne, regarded as a model in its kind.

As a manufacturing town Lyons early acquired and has long maintained a first place. It is the most important centre of silk manufacture in the world, employing directly and indirectly over 200,000 persons. Other manufactures are hats, boots, jewelry, and liqueurs; besides dye-works, foundries, glass-houses, potteries, tanneries, breweries, and chemical works. Lyons is admirably situated for trade, on two navigable rivers, which make it a great entrepot both for the north and the south. It forms the common centre where the highways and railroads from Paris, Marseilles, Bordeaux, from Switzerland, and Italy, all meet; it communicates with the Rhine by the Rhône and Rhine Canal, while several other canals, branching off from its rivers, give it ample means of transport over a great part of the interior of the country. The chief imports are raw silk, wine, brandy, oil, soap, flax, hemp, rice, salt, cotton, wool, coffee, dyes, earthenware, and timber; and the exports, spun-silk and silk-goods ribbons, hats, straw-bonnets, woolens, flannels, linens, corn, flour, chestnuts, liqueurs, paper, hemp, ironware, etc.

As Lugdunum, Lyons was an early Gallic town, and when Cæsar invaded Gaul was a place of some importance; it figures more or less in the subsequent history of the Roman Empire, several emperors in succession making it their occasional residence and vying with each other in adorning it. It early received Christianity, and toward the end of the 2d century numbered thousands of Christians among its inhabitants. Its first bishop, Pothinus, died a martyr in 197, and his successor Irenæus died also a martyr in 202. Lyons was afterward sacked by the Huns and Visigoths, who destroyed many of its noblest Roman structures. In the 8th century it fell for a time into the hands of an army of Saracens from Spain, and suffered severely; but recovered its prosperity under Charlemagne, on the dissolution of whose empire it became the capital of the kingdom of Provence. Subsequently it fell under ecclesiastical domination, and was long governed by a succession of archbishops. In 1312 Lyons was annexed to the crown of France. It owes its new quays and several of its finest edifices to Louis XIV. The revolution of 1793 occasioned fearful reverses. The inhabitants, finding their industry paralyzed and their trade destroyed, rebelled against revolutionary violence, and the convention let loose its forces upon them; wholesale butcheries for many days deluged the town with blood. Since that period questions of an economical, or rather socialist nature, culminated in the sanguinary revolts of 1831, 1834, 1849 and 1871. Several important figures in history were natives of Lyons, among them the Roman emperors Marcus Aurelius, Claudius, and Caracalla, and the celebrated general Germanicus. Pop. about 470,000.



LYRE BIRD.

Lyons, Iowa, formerly an independent city in Clinton County, but incorporated with the city of Clinton in 1895. See CLINTON.

Lyons, Kan., city, county-seat of Rice County; on the Atchison, T. & S. Fe, the Missouri P., the St. Louis & S. F. R.R.'s; about 180 miles west by south of Topeka and 25 miles north by west of Hutchinson. It is situated in a fertile agricultural region in which stock-raising is a prominent industry. Nearby are salt deposits, like that at Hutchinson in Reno County, a remarkably fine salt, obtained from a considerable depth below the surface. Some of its industrial establishments are salt works, grain elevators, gas-engine works, and flour-mills. Its trade is chiefly in grain, salt, live-stock, flour, and corn. The city owns and operates the waterworks. Pop. (1910) 1,071.

Lyons, N. Y., village, county-seat of Wayne County; on the Erie Canal, and on the West Shore and the New York C. & H. R. R.R.'s; about 40 miles east by south of Rochester. Lyons was founded in 1795 and incorporated as a village in 1854. It is situated in a fertile agricultural region, and its extensive water power has contributed to its development as a manufacturing village. Its chief manufacturing establishments are a beet-sugar factory, barrel factory, distilleries of peppermint oil, a pottery, and machine-shops. Slipper-soles and silverware are also manufactured. The Union School Library has about 4,000 volumes. Pop. (1910) 4,460.

Lyons, Councils of, two synods held at the city in France from which they derive their name and considered ecumenical by the Roman Catholic Church. When the quarrel between the Emperor Frederick II. and Innocent IV. had resulted in the banishment of the latter from Rome, the pope summoned a council in 1245 at which the patriarchs of Aquileia, Antioch and Constantinople, as well as the Emperor Baldwin II., were present with several royal delegates. Thaddæus of Susa represented Baldwin, who was, in spite of that delegate's emphatic protests, solemnly deposed, and his subjects released from their allegiance. When Gregory X. took the tiara, his first step was to attempt a reunion of Christendom, as represented by the Greek and Latin churches, which had been parted by schism mainly on the question of the *filioque* (q.v.), and Latin accretions to the doctrine of purgatory. The second Council of Lyons met 1274 under his presidency and the desired union was apparently effected, for both Greek and Latin prelates sang the creed including the clause asserting the double procession. The tie that bound them, however, proved a rope of sand, and the schism has continued to this day. See GREEK CHURCH.

Lyons, Gulf of. See LION OR LYONS, GULF OF.

Lyre, the most ancient of stringed instruments, which originally had but three strings. The Egyptian and Grecian lyres were at first strung with the sinews of animals. The number of the strings was at last increased to sixteen. It was played with a stick of ivory or polished wood, also with the fingers. The body of the lyre was hollow, to increase the sound. Few objects are so graceful in form and susceptible of such various application in the fine arts. As a musical instrument it has now gone out of use among the civilized nations, though a rude form of it is still to be met with in the hands of the shepherds of Greece and among the negro tribes of Africa. It is the symbol of Apollo.

Lyre-bird, a remarkable Australian bird which derives its name from the form of the tail in the male, which much resembles that of the conventional Apollo's lyre; the tail of the female is rather long, but simply wedge-shaped. There are two species, about the size of chickens, both reddish brown and called «native pheasants» by the colonists, constituting the genus *Menura* and family *Menuridæ*, and regarded as the lowliest of the *Passeres*, and of very ancient origin. They dwell in the «scrub» or open woods, and rarely leave the ground, avoiding their enemies by swift running. Their nests are placed upon the ground, are well woven of sticks and plant-stems, and are covered by a dome-like roof, leaving an entrance only at the sides. In the mating season the males scrape up mounds of leaves and rubbish upon which they strut about, sing and do their best to display their long and handsome tails to the hens. The better known species is the long-tailed one (*M. superba*), but both are now rare.

Lyr'ic Poetry, that species of poetry by which the poet directly expresses his emotions. The predominance of feeling in lyric poetry is what chiefly distinguishes it from dramatic poetry, in which action and character, independent of the individual emotion of the poet, predominate; and from epic poetry, of which a series of actions and characters, as contemplated and exhibited by the poet, is the characteristic. It is necessary that the feeling represented should be itself poetical, and not only worthy to be preserved, but accompanied by a variety of ideas, beauty of imagery, and an eloquent flow of language. Milton, Chatterton and Burns are among the better known English writers of lyric poetry.

Lys, lēs, or **Leye,** lī-ĕ, Belgium, an affluent of the Scheldt, which rises near Lysbourg, Pas-de-Calais, France, and after a northeasterly course of 130 miles, unites with the Scheldt at Ghent, Belgium.

Lysander, lī-săn'dėr, Spartan general: d. 395. His father was Aristocritus, a Lacedæmonian of the purest blood, being of Heracleidan descent, his mother a Helot who brought him up in poverty. His fine qualities, however, procured him the command of the Spartan fleet off the coasts of Asia Minor (408). He established his headquarters at Ephesus, which he raised to prosperity. Next year he was succeeded by Callicratidas. In a short time his reputation had so increased that the Asiatic allies of Sparta requested the Lacedæmonians to invest him a second time with the command. Accordingly, Lysander with the title of vice-admiral (405 B.C.), defeated and captured the Athenian fleet off Ægospotamos. This decisive victory put an end to the Peloponnesian war. Shortly afterward he set sail for Athens, which he blockaded. The city was starved into capitulation (404), the long walls and the fortifications of the Piræus were demolished; and the oligarchy of the Thirty Tyrants was established, which governed with terrible cruelty. Lysander then returned to Lacedæmon, where his ambitious and unscrupulous character made itself more palpable than ever. He was excessively fond of praise, and was the first of their own countrymen to whom the Greeks erected altars, offered sacrifices as to a god, and celebrated festivals. On his return to Sparta Lysander, stung by the ingratitude of Agesilaus, whose succession to the throne he had secured, resolved to destroy the constitution of his country by abolishing hereditary monarchy, making the throne elective, but the Delphic and other oracles were unfavorable, in spite even of his bribes. On the outbreak of the Bœotian war (395 B.C.) he marched against Haliartus and was killed in battle under its walls.

Lysias, lĭs'ĭ-as, Athenian orator: b. about 458 B.C.; d. about 380. He was a son of Cephalus, an orator, of whom Plato makes honorable mention in his 'Republic.' Lysias, at 14 went to Thurium, in Magna Græcia, to study philosophy and eloquence under Tisias and Nicias of Syracuse. Having settled in Thurium, he was employed in the government; but on the defeat of the Athenians in Sicily was banished with many of his countrymen. After Athens had recovered its freedom he exerted himself for the advantage of the city, and sacrificed much of his property for the public welfare. At first he gave instruction in eloquence; but finding himself surpassed by Theodorus, another teacher of oratory, he devoted his time to writing orations for others. He wrote more than 200, some say 400 orations, but only 223, however, were regarded as genuine. His style is applauded as a perfect example of the simple Attic eloquence. Only 34 of his orations have come down to our times. They have been published in various collections of the Attic orators; among the best separate editions of them are those by Baiter and Sauppe (1850); Cobet (1863); Thalheim (1901). See Jebb, 'Attic Orators,' Vol. I. (1880).

Lysicrates, lī-sĭk'ra̤-tēz, **Monument of,** located in Athens; one of the earliest examples of Corinthian architecture. It was dedicated 334 B.C. to Dionysus, by Lysicrates, as a trophy for winning the Dionysian games. The monument, which was built in the form of a round temple was surmounted by a bronze tripod and stood on a cubical base 13 feet high. The building on account of its shape was popularly known as the "Lantern of Demosthenes."

Lysima'chia. See LOOSESTRIFE.

Lysimachus, lī-sĭm'a̤-kŭs, general and one of the diadochoi of Alexander the Great: b. Pella, Thessaly, 361 B.C.; d. near Corus 281 B.C. He was a low born Macedonian of great physical strength and courage. On the death of Alexander, 323 B.C., Thrace fell to the share of Lysimachus, who became also satrap of Macedonia in 286. The murder of his son Agathocles, a great favorite of the people, at the instigation of his Egyptian wife Arsinoe, provoked a revolt in Asia; Seleucus, satrap of Syria, took up the cause of the widow of Agathocles, Lysandra, and Lysimachus was killed in the battle near Corus which ensued. He founded a city on the Hellespont, named after him Lysimachi.

Lysippus, lī-sĭp'ŭs, Greek sculptor who flourished in Sicyon between 360 and 316 B.C. Alexander the Great would permit no one but Apelles to paint his portrait, and no one but Lysippus to make his statue. Lysippus was first a smith, and afterward devoted himself to sculpture, adopting the canon of Polycletes, as exemplified in that artist's 'Doryphorus.' This canon, or standard of beauty, presents the human form with the head smaller, and the limbs longer and slenderer than in life. His statues were wrought with much greater ideal beauty than those of his predecessors. They were almost all, if not all, in bronze, and he is said to have left behind him some 1,500 works. Several of his more celebrated statues were those of Alexander, the most noted of which represented the Macedonian hero bearing a lance. This was considered as a sort of companion to the picture of Apelles in which Alexander was seen, like a second Zeus, launching a thunderbolt. Among his principal ideal works are the colossal 'Zeus' at Tarentum; 'Phœbus Apollo in his four horse Chariot' at Rhodes; the bronze statue of 'Opportunity' at the entrance of a temple in Sicyon, of which several copies are extant; the colossal bronze statue of 'Hercules' at Tarentum, and the famous 'Athlete,' of which the 'Apoxyomenus' of the Vatican is a copy.

Lysol, a brown, oily liquid, having an odor resembling creosote. It is prepared from tar oil by saponification; is a useful antiseptic for the hands in a 1 or 2 per cent solution, and is chiefly used in obstetrical operations.

Lyte, līt, **Eliphalet Oram,** American educator: b. Bird-in-Hand, Pa., 29 June 1842. In his youth he served in the Union army during the Civil War. He was graduated from the State Normal School at Millersville, Pa., in 1868, was professor of English and pedagogics there, 1868–87, and has been principal of that institution from 1887. He was president of the National Educational Association 1890–9, and has published 'Practical Bookkeeping' (1883); 'Grammar and Composition' (1886); and other text-books.

Lyte, Henry Francis, English Anglican clergyman and hymn writer: b. Ednam, near Kelso, Scotland, 1 June 1793; d. Nice, France, 20 Nov. 1847. He was graduated from Trinity College, Dublin, and took orders in the Anglican Church, 1815. He was curate of Lower Brixham, Devonshire, 1823–47. He published 'Tales Illustrative of the Lord's Prayer' (1826); 'Poems, Chiefly Religious' (1833); 'Miscellaneous Poems' (1868); 'Memoir of Henry Vaughan'; 'Abide With Me'; 'Pleasant Are Thy Courts'; 'Jesus, I My Cross Have Taken'; and other hymns of his have become widely popular both in America and England.

Lytle, lĭt'l, **William Haines,** American general and poet: b. Cincinnati, Ohio, 2 Nov. 1826; d. Chickamauga, Tenn., 20 Sept. 1863. He was graduated at Cincinnati College, studied law and practised for a short time. He served as a captain in the Mexican War, and later was a member of the Ohio Legislature. During the Civil War he was colonel of the 10th Ohio regiment and was brigadier-general of volunteers, having been promoted to that rank for gallant conduct. He was killed at the battle of Chickamauga. His best-known poem is the famous 'Address of Antony to Cleopatra,' the opening line of which is "I am dying, Egypt, dying." Consult 'Poems' with 'Memoir' by Venable (1884). No complete collection of his works was published.

Lytton, lĭt'ŏn, **Edward Robert Bulwer-Lytton,** EARL OF, English poet and diplomatist: b. London 8 Nov. 1831; d. Paris 29 Nov. 1891. He was the only son of the well-known novelist, Bulwer-Lytton (q.v.). He was educated at Harrow and Bonn, and entered the diplomatic service in 1849, being appointed attaché at Washington, where his uncle, Lord Dalling, was minister. Subsequently he held diplomatic posts at Florence (1852) and other European capitals, and was secretary of legation successively at Copenhagen, Athens, Lisbon, and Madrid. In 1874 he was appointed minister at Lisbon, and was made viceroy of India by Disraeli in 1876. At a great durbar held at Delhi in 1877, he proclaimed Queen Victoria Empress of India. In the great famine of 1877–8 he conducted admirably the work of relief. He adopted an active policy in Afghanistan, which brought about the second Afghan war (1879). His administration was marked by notable internal reforms, such as the abolition of the inland customs, the repeal of duties on cottons, and the promulgation of new civil service rules. In 1880 he was created Earl of Lytton, and when the Conservative government retired in that year he sent in his resignation as viceroy. In 1887 he was appointed British ambassador at Paris. For many years Lytton was better known as a poet than as a diplomatist, under the pseudonym of "Owen Meredith." His published works include: ‘Clytemnestra, and Other Poems’ (1855); ‘The Wanderers’ (1859); ‘Lucile’ (1860), a story in rimed anapæstic couplets, which met with a very great popular success; ‘The Ring of Amasis’ (1863); ‘Orval, or the Fool of Time,’ which is the solitary representative in English of the great Polish school of mystic verse (1869); ‘Fables in Song’ (1874); ‘Speeches of Edward Lord Lytton,’ with a memoir (1874); ‘The Life and Letters of Edward Bulwer, Lord Lytton’ (1883, the narrative comes down only to 1832); ‘Glenaveril’ (1885); ‘After Paradise’ (1887); ‘King Poppy,’ his best poetical work, abounding in lofty poetry and gay irony, appeared posthumously (1892). As a prose writer Lytton takes high rank.

Lytton, Lord. See BULWER-LYTTON, EDWARD.

M

M the thirteenth letter of the English and most of the other West European languages, is one of the four liquids, or semi-vowels; it is also classed as a labio-nasal, its sound being produced when with lips closed and the whole uvula lowered, the breath makes a humming noise as it issues through the nostrils. The lips play the same part in the pronunciation of m as in that of b, but in pronouncing b the nasal passage has no part. Hence when that passage is obstructed or closed the sound produced is that of b not of m.

The M as a capital letter has the same form in the Greek and the Latin alphabets and in all the alphabets derived from them, and in all those alphabets generally the same sound value.

In English there are a few words of Greek origin, mostly technical, in which mn begins a syllable or a word: in such cases the m is silent, for example, mnemonic, nemonic.

In many words derived from other languages the m of the original word is changed to n in English, examples: Comitatus (Lat.) county, or contrariwise n is changed to m; Anglo-Saxon henep becomes hemp. Often p is added after m to give that letter greater distinctness, for example, exemtus, exemptus, unkemmed, unkempt.

M. Quad. See Lewis, Charles Bertrand.

Maartens, Maarten, mär'tĕn mär-tĕnz, pseudonym of the Dutch author, J. M. W. van der Poorten Schwartz: b. Amsterdam 15 Aug. 1858. He passed his early life in England; was educated in Germany and at the University of Utrecht, was admitted a barrister, but chose literature as a profession, and in 1890 published his first work, 'The Sin of Joost Avelingh,' which at once arrested the attention alike of critics and of reading public. This, like all his volumes, was written at first hand in English, not, as has been sometimes supposed, translated from Dutch MS. Maartens thus presents the curious instance of an author electing to address wholly a foreign public. Indeed, only with reluctance, to safeguard himself against unsatisfactory translations, did he consent to the publication of his books in Dutch. His further works are: 'An Old Maid's Love' (1891); 'A Question of Taste' (1891); 'God's Fool' (1892); 'The Greater Glory' (1894); and 'My Lady Nobody' (1895); 'My Poor Relations' (1903). In America 'The Greater Glory' first appeared, serially in 'The Outlook.' 'God's Fool' is perhaps Maartens' best, but 'The Sin of Joost Avelingh' and 'The Greater Glory' have had the greatest popular success. These books afford a by no means flattering picture of the Dutch *bourgeoisie,* but are admittedly accurate.

Maasin, mā-ā'sĭn. Philippines, (1) a pueblo of the province of Leyte, island of Visayas, situated on the extreme southwestern coast, 75 miles southwest of Tacloban. It is a handsome, well-built city, and has a large trade, mostly in hemp. Pop. 18,500; (2) a town of the province of Iloilo, Panay, on a tributary of the Sague branch of the Jalaur River, 18 miles northwest of Iloilo. Pop. 9,700.

Maastricht. See Maestricht.

Maat, or Mat, in ancient Egypt, the goddess of truth and justice. She is said to have guided the souls of the dead to Osiris (q.v.).

Mab, the fairy queen of Connaught and a familiar name in Celtic folk-lore. Mab has been celebrated by Shakespeare and other English poets. The name is of uncertain origin, being variously derived from the Midgard of the Eddas, the Habundia or Dame Abonde of Norman fairy lore, and from the Cymric *mab,* a child. According to Voss, Mab was not the fairy queen, the same as Titania, this dignity having been ascribed to her only by mistaking the use of the old English word *queen,* which originally meant only a woman. Queen Mab is mentioned in Shakespeare's 'Romeo and Juliet,' Ben Jonson's 'Satyr,' Randolph's pastoral of 'Amyntas,' Drayton's 'Nymphidia,' and Milton's 'L'Allegro.'

Mabalácat, mä-bä-lä'kät, a pueblo of the province of Pampanga, Luzon, 16 miles north of Bacolor, the provincial capital. It is on the main road, and on the Manila and Dagupan railroad. Pop. 10,600.

Ma'bery, mā'bĕr-ĭ, **Charles Frederic,** American chemist: b. North Gorham, Maine, 13 Jan. 1850. He was graduated at the Lawrence Scientific School, Harvard, in 1876, and was assistant instructor in chemistry there from 1875 to 1883, since when he has been professor of chemistry in the Case School of Applied Science of Cleveland, Ohio. In the investigation of the composition of American petroleum his work has brought him into special prominence. He has also done valuable work in connection with the production of aluminum by means of electricity. The results of his original investigations at Harvard were largely published by him in papers appearing in the 'American Chemical Journal.'

Mabie, Hamilton Wright, American editor and author: b. Cold Spring, N. Y., 13 Dec. 1845. He was graduated from Williams College in 1867, from the Columbia Law School in 1869, practised law in New York in 1869–79. in 1879 became connected with the 'Christian Union' (now 'The Outlook'), and in 1884 formally entered its editorial staff. He became known as a contributor of essays to periodicals, and as an occasional speaker and lecturer on educational and literary subjects. Among his public ad dresses was that at the dedication of the Zolnay bust of Poe in the University of Virginia. He also became president of the New York Kindergarten Association. His works are: ‘Norse Stories Retold from the Eddas’ (1882); ‘Nature in New England’ (1890); ‘My Study Fire’ (1st series, 1890; 2d, 1894; 3d, 1899); ‘Under the Trees and Elsewhere’ (1891); ‘Short Studies in Literature’ (1891); ‘Essays in Literary Interpretation’ (1892); ‘Nature and Culture’ (1897); ‘Books and Culture’ (1897); ‘Work and Culture’ (1898); ‘In the Forest of Arden’ (1898); ‘The Life of the Spirit’ (1899); ‘Shakespeare: Poet, Dramatist and Man’ (1900); ‘Works and Days’ (1902); ‘Parables of Life’ (1902).

Mabillon, Jean, zhŏṅ mä-bē-yŏṅ, French ecclesiastic and author: b. St. Pierre du Mont, Champagne, 23 Nov. 1632; d. Paris 27 Dec. 1707. Having joined the Benedictines of Saint Maur, he was chosen to assist Dom Jean d'Achery in the compilation of his ‘Spicilegium Veterum Scriptorum,’ and subsequently edited the works of St. Bernard (1690) in the series of the fathers published by his congregation. In 1683 he was sent to Germany by Louis XIV. to collect documents relating to French history; and the applause with which his ‘Iter Germanicum,’ a narrative of the journey, was received, induced the king to send him to Italy in 1685 to make purchases for the royal library. A result of this tour was his ‘Museum Italicum’ (1687–9), a work of great value. Later he was selected by his superiors to refute Rancé, abbot of La Trappe, who had condemned the custom of permitting monks to study. His ‘Essay on Monastic Studies,’ which appeared in consequence in 1691, was equally remarkable for sound argument and good temper. His most important other works are: ‘Vetera Analecta’ (1675–85); ‘De Re Diplomatica’ (1681); and ‘De Liturgia Gallicana’ (1685). He edited and published with Ruinart ‘Acta Sanctorum Ordinis Sancti Benedicti,’ and published the first four volumes of the ‘Annales Ordinis Benedictini’ (1703–39). A collection of his ‘Ouvrages posthumes’ appeared in 1724, and his ‘Inedited Correspondence with Montfaucon, Magliabecchi, etc.,’ was edited by Valery (1847).

Mabini, mä-bē'nē, **Apollinario,** Filipino insurgent: d. Philippine Islands 1903. He was educated in the Catholic College of Manila, entered the public service under Spanish rule, became advocate of the treasury, resigned in 1896, and entered the insurrection. He became privy councillor of Aguinaldo, and for a time was minister of foreign affairs and chief of the supreme court in the latter's so-called government. In 1899 he surrendered to the United States, was sent into exile, but allowed to return in 1903. He was the brains of the Malolos government while it lasted.

Mabinogion, măb-ĭ-nō'gĭ-ŏn, **The,** the name generally but incorrectly applied to all mediæval Welsh stories. Of the general title ‘Mabinogion,’ which Lady Charlotte Guest's English version (1838–49) has made familiar, John Rhys gives an explanation. “An idea prevails,” says Principal Rhys, “that any Welsh tale of respectable antiquity may be called a mabinogi; but there is no warrant for extending the use of the term. . . . For, strictly speaking, the word mabinog is a technical term belonging to the bardic system, and it means a literary apprentice. In other words, a mabinog was a young man who had not yet acquired the art of making verse, but who received instruction from a qualified bard. The inference is that the ‘Mabinogion’ meant the collection of things which formed the mabinog's literary training — his stock in trade, so to speak; for he was probably allowed to relate the tales forming the ‘four branches of the Mabinogion’ at a fixed price established by law or custom. If he aspired to a place in the hierarchy of letters, he must acquire the poetic art.” In Lady Charlotte Guest's later edition in one volume (1877),— the most convenient edition for reference,— 12 tales in all will be found. Of these, the most natively and characteristically Welsh in character are such tales as the vivid, thrice romantic ‘Dream of Rhonabwy,’ which owes little to outside sources. ‘The Lady of the Fountain,’ on the other hand, shows in a very striking way the influence of the French chivalric romances that Sir Thomas Malory drew upon so freely in his ‘Morte d'Arthur.’ In the admirably edited Oxford text of the Welsh originals by Rhys and Evans' (1887–90), ‘The Lady of the Fountain’ appears under the title of ‘Owain and Lunet’; and Lunet's name at once recalls Tennyson's ‘Idylls of the King.’ The old manuscript volume of the ‘Mabinogion,’ known as the ‘Llyfr Coch o Hergest,’— the ‘Red Book of Hergest,’— is in the famous library of Jesus College, Oxford, the one college in the older English universities which has a time-honored connection with Welsh scholarship and Welsh literature.

Mably, Gabriel Bonnot de, gä-brē-ĕl bŏn-ō dė mä-blē, French ecclesiastic and publicist: b. Grenoble 14 March 1709; d. Paris 23 April 1785. His family name was Bonnot. Like his younger brother, the philosopher Condillac (q.v.), he was destined for the Church, and after studying at the seminary of Saint Sulpice in Paris was ordained subdeacon. He showed little liking for theology, and for some time was secretly employed in affairs of state by his relative Cardinal de Tencin, minister of Louis XV., conducting the most difficult negotiations and writing elaborate reports with an ability for which the minister received all the credit. Later he applied himself to literature, and in 1748 published his ‘Droit publique de l'Europe,’ which achieved a remarkable success. It was followed by ‘Observations sur les Grecs’ (1749); ‘Observations sur les Romains’ (1751); ‘Entretiens de Phocion’ (1753); ‘Observations sur l'Histoire de France’ (1755); ‘Principes des Négociations’ (1757); ‘De la Manière d'écrire l'Histoire’ (1773); ‘De la Législation’ (1776); ‘De l'Idée de l'Histoire’ (1778); and ‘Principes de Morale’ (1784). Having been requested by the government of Poland to prepare for them a code of laws, he visited that country in 1771, and published in 1781 a work ‘Du Gouvernement de la Pologne.’ He was also consulted by the American congress in 1783 on the preparation of the Constitution, and embodied his views in his ‘Observations sur le Gouvernement et les Lois des Etats Unis d'Amerique’ (1784). In this work he foretold the speedy downfall of the United States. Consult: Guervier, ‘L'Abbé Mably, Moraliste et Politiqué’ (1886).

Mabuchi, mä-boo'chē, Japanese writer and religious teacher: b. 1693; d. 1769. He was distinguished as a scholar, and utilized his great learning in the endeavor to purify the native religion, Shinto, from the accretions of Chinese and Buddhist philosophy, etc., whereby he regarded it as having been corrupted. His love and knowledge of antiquity enabled him to present the native faith in its original simplicity, and his teachings were exemplified in his own life. To him modern students are largely indebted for direct success to ancient Japanese poetry.

Mac, or **Mc,** a Gaelic prefix, as MacGregor, MacDonald, McKinley, etc. It corresponds with son in surnames of Teutonic origin, Fitz in those of Romance origin, or Ap or Ab in Welsh surnames.

Macabebe, mä-kä-bä'bä, Philippines, a pueblo of the province of Pampanga, Luzon, situated at the head of the Pampanga River delta, 9 miles from Manila Bay and 7 miles southeast of Bacolor. Pop. 10,400.

Macaber (mạ-kä'bėr) **Dance.** See DANCE OF DEATH.

Macadam, măk-ăd'am, **John Loudon,** Scottish engineer: b. Ayr 21 Sept. 1756; d. Moffat, Dumfriesshire, 26 Nov. 1836. In 1770 he was sent to an uncle at New York, where he remained during the War of Independence, and realized a considerable fortune as agent for the sale of prizes. At the close of the War he returned to Scotland, and in 1798 was appointed agent for revictualing the navy in the western ports of Great Britain, and took up his residence at Falmouth. He afterward resided for many years at Bristol. It was here, in 1815, on being appointed surveyor-general of the Bristol roads, that he first had full scope for putting in practice the important improvements in road-making which had long before occupied his thoughts. By 1823 his general success was admitted; and in 1827 he was made general surveyor of roads. In carrying out his improvement he had expended several thousand pounds from his private resources; and the House of Commons, having been satisfied of the fact by the investigation of a committee, both reimbursed the actual outlay, and presented him with an honorary tribute of £2,000, presenting to him a total of £10,000. His invention was rapidly introduced throughout the civilized world, and his own name was made synonymous with it.

Macadam, a modern system of road-making invented by J. L. Macadam (q.v.), which consists in forming the roads out of hard materials such as granite, or basalt broken into pieces, none of which are too large to pass through an iron ring 2½ inches in diameter, and then deposited evenly in a bed of from 6 to 12 inches in thickness. The bed thus laid becomes perfectly compact and smooth; and in proportion as it is worn away, or cut into ruts by traffic, can easily be restored by a new coating of materials. See ROADS AND ROAD-MAKING.

McAdoo, măk-ạ-doo', **William Gibbs,** American jurist: b. near Knoxville, Tenn., 4 April 1820; d. 1894. He was graduated in 1845 from the East Tennessee University at Knoxville, sat in the Tennessee Legislature 1845–6, and served in the Mexican War in 1847. He was afterward admitted to the bar and was attorney-general of the Knoxville judicial district, 1851–60. He removed to Georgia in 1862, served in the Confederate army during the Civil War and in 1871 became judge of the 20th judicial district of Georgia. With H. C. White he published 'Elementary Geology of Tennessee.'

McAfee, mạ kăf'ē, **Robert Breckinridge,** American historian: b. Mercer County, Ky., February 1784; d. there 12 March 1849. From 1833 to 1837 he was United States *chargé d'affaires* at Bogota, Colombia, and he was a member of the Royal Antiquarian Society of Denmark. He published 'History of the War of 1812' (1816), and much important information has been gleaned from his private journals relating to the early history of his native State.

McAlester, mạ-kăl'ĕs-tėr, **Miles Daniel,** American general: b. New York 1833; d. 1869. He was graduated from the United States Military Academy in 1856, and entering the engineer service became chief engineer of the department of the Ohio in 1862. In 1864 he was brevetted colonel and a year later brigadier-general.

MacAlester College, a coeducational institution in St. Paul, Minn.; founded in 1885 under the auspices of the Presbyterian Church. Its departments are academic, collegiate, and musical. It also conducts a summer school with brief courses connected with the three departments. The degrees granted are A.B. and Lit.B. In 1910 there were connected with the school 27 teachers and nearly 310 students. The library contained about 8,000 volumes, and the income from tuitions and other sources was about $38,000.

McAll (mạ-kăl') **Mission,** a Protestant association founded in 1871 by Robert Whitaker McAll (q.v.), and his wife, for religious work among the working people of France. On 17 Jan. 1872 the first station was opened in Belleville, one of the manufacturing suburbs of Paris. The work consists largely in striving to interest people in the questions pertaining to salvation of souls, and then urging them to affiliate with some one of the nearby Protestant churches. No effort is made by the Mission to establish churches, but some educational work has been begun in the large cities. Reports of the work for the year 1902 give in France 72 stations there the meetings are held in halls, and two mission boats. Friends of the movement in America, founded an American McAll Mission in 1883 with Philadelphia as headquarters. There are now in the United States about 65 auxiliary associations that collect and send to the French missions about one half of the whole amount of annual expenditures. The expense of the French work, in 1902, was $68,302. Great Britain has 22 auxiliary associations and Canada 10. Friends in other countries contribute to the support of the missions.

McAllister, Samuel Ward, American society leader: b. Savannah, Ga., about 1830; d. 1895. He came of a family several of whose members were conspicuous at the bar. With his father, in 1850, he went to California, where he remained two years, and whence he removed to Newport, R. I., and afterward to New York city. Becoming possessed by marriage of a considerable fortune, he was able, by means of influential connections through his mother and wife, to enter into social life with the advantages of personal qualification and family prestige. As a raconteur as well as an accomplished gourmet he had already attained prominence within a select circle when, by a well-turned remark, he became the leader of leaders in New York society, which, according to his strict limitation, included but 400 persons. The popular expression «The Four Hundred» originated from this assertion of McAllister's. He made contributions to the press, which, however, impaired rather than strengthened his unique position, as did also his volume ‹Society as I have Found It› (1890).

McAllister, Fort. See FORT MCALLISTER.

McAlpine, mă-kăl'pĭn, **William Jarvis,** American engineer: b. New York 1812; d. New Brighton, Staten Island, N. Y., 16 Feb. 1890. He took up engineering in 1827 under J. B. Jervis, with whom he continued till 1839, and succeeded him as engineer of the Erie Canal enlargement. In 1851 he became State engineer of New York and State Railroad Commissioner 1855–7. He was subsequently engineer of several important railways, constructed the city waterworks at Albany and Chicago, and in 1870 his plans for improvement of the Cataracts of the Danube were accepted by the Austrian government. While engineer of the department of parks 1879–80, he constructed the Riverside Drive in New York.

Macao, mä-kow' or mä-kä'ō, China, a Portuguese settlement and seaport on the west shore of the mouth of the Canton River, 40 miles west of Hong-Kong. It occupies a high peninsula, formerly the island of Macao, but now united by a narrow isthmus north of the town with the island of Hiang-shan. The settlement is about eight miles in circuit; and its limits landward are defined by a barrier wall stretching across the isthmus, where a guard of Chinese troops is stationed to prevent foreigners from trespassing on the Inner Land. The town occupies a slope gradually descending to the sea, backed by a range of lofty hills, and having an extensive plain stretching east. It is nearly surrounded with water, and is open to the sea-breezes on every side. The houses occupied by the foreign population are large, roomy, and open; and the shops are numerous. The quay or «Praya Grande» is commodious, forms a pleasant drive, and is protected by a battery. The harbor is formed between the peninsula on which the town stands and the large island of Twee-lien-shan, to the west. Macao is considered the healthiest residence in southeast Asia. Near it, in a beautiful garden, is the grotto in which the poet Camoens is said to have finished the ‹Lusiad.› The principal exports are tea, cassia and cassia oil, anise and anise oil, and opium. The commerce, which is chiefly carried on with Hong-Kong, Canton, Batavia, and Goa, has greatly declined since the opening of the rival free ports, and a considerable part of the colonial revenue, which amounts to about $375,000, is drawn from a tax on the gambling tables for which Macao is notorious. The Portuguese first obtained permission to form a settlement and to trade at Macao in 1557. From 1563 they were required to pay a yearly tribute to the Chinese government, and their trading privileges were much restricted till 1844, when they were allowed to carry on commerce with the five ports then open to foreigners. Macao was then declared a free port, but the Chinese continue to ignore the territorial claims of the Portuguese. Pop. about 80,000, inclusive of 74,568 Chinese, 3,898 Portuguese and 116 foreigners.

Macaque, ma-kăk', one of the small, short-tailed Asiatic monkeys of the genus *Macacus* and family *Cercopithecidæ,* which are so docile, intelligent and interesting as a rule that they are common in menageries and frequently kept as pets; their gentleness and playfulness disappears as they grow old, however, and they are then likely to become morose and savage. They go about in troops, keeping by themselves, and differing from other monkeys in most of their actions and cries. Some of the best known are the quaintly crested capuchin, or bonnet-monkey (*M. sinicus*), excessively common and pestiferous in southern India; the entellus monkey (q.v.) of northern India; the large pig-tailed (*M. leoninus*) of Japan, whose likeness is seen in numberless Japanese drawings and carvings. Ranging over so wide a variety of countries their habits and food differ greatly. Besides the fruit, juicy leaves and insects eaten by most monkeys they devour small reptiles, young birds, frogs, and crabs, the last-named forming the principal diet of a Malayan species (*M. cynomolgus*). One species is isolated in the mountains of Algeria and Morocco, whence they were long ago carried, no doubt, to the island of Gibraltar, where they are known to the English of the garrison as «Barbary apes» (*M. inuus*), and the small band upon the Rock are carefully protected from harm.

Macaro'ni (Ital. *maccheroni*), a peculiar paste or dough prepared from wheat flour and manufactured into tubes or ribbons. It is an Italian invention, and, though made by a simple process, has never been produced with so great success in any other country. The grain grown in the more southern countries of Europe is said to possess a greater amount of gluten, and is therefore better adapted to this manufacture. The wheat, after being washed, is freed from the husks and ground in water mills, when hot water is added till it is of the consistency of stiff dough. Five different qualities of flour are obtained by an equal number of siftings, the last giving the finest and most delicate that can be made. To reduce the dough to tubes or ribbons, a hollow cylindrical cast iron vessel is used, having the bottom perforated with holes or slits. When this is filled with the paste, a heavy iron plate is driven in by a powerful press, which forces the paste through the holes, and gives it the shape of the perforations, the workman cutting off the pieces of the desired length as they come through. During this process it is partially baked by a fire made under the cylinder. Sometimes the flat pieces are formed into tubes by uniting the edges before they are thoroughly dry. After being hung up for a few days they are ready for use. The largest tubes are called *maccheroni,* the smaller *vermicelli,* and the smallest *fedelini.* Macaroni is prepared for the table by boiling and baking with grated cheese, and is in common with vermicelli and the other varieties much used in the preparation of soups. Since about 1880 the use of macaroni in the United States has largely increased, and where it was once only consumed by Italians in this country, it is now eaten by all classes. Numerous macaroni factories have been established in New York and elsewhere. The United States imports annually from Italy over 500,000 boxes of macaroni.

Macaron'ic Verse, a kind of facetious poetry in which foreign words are distorted and jumbled together; so called by Teofilo Folengo, a Mantuan monk of noble family, who published a book entitled 'Liber Macaronicorum,' a poetical rhapsody, made up of words of different languages. His principal poem was called macaronic, because it was mixed up of Latin and Italian, as macaroni is mixed up with cheese. Consult Morgan, 'Macaronic Poetry.'

MacArthur, Arthur, American general: b. Springfield, Mass., 2 June 1845; d. Milwaukee, Wis., 5 Sept. 1912. Having enlisted in the United States volunteer service in Wisconsin he served through the Civil War period, being promoted lieutenant-colonel and brevet-colonel in May 1865, for gallant and meritorious conduct in the battles of Perryville, Ky., Stone River, Tenn., Mission Ridge and Danridge, Ga., Franklin, Tenn., and in the Atlantic campaign. He was mustered out of the volunteer service in June 1865, and entered the regular army with the rank of lieutenant in the 17th United States infantry the following year. In the Spanish-American War he was appointed a brigadier-general of volunteers, and assigned to the Philippine expeditionary forces. He was promoted brigadier-general in the regular army, 2 Jan. 1900; commander of the Military Division of the Philippines, major-general U. S. A., 1901, and lieutenant-general, 15 Sept. 1906. He returned in 1901, and in 1902 commanded the Eastern department, 1902–3 the Lakes, 1903–4 of California, and 1904–7 the Pacific division.

MacArthur, Duncan, American pioneer: b. Dutchess County, N. Y., 14 June 1772; d. Ohio 1839. His family removed in 1780 to the western frontier of Pennsylvania, and at 18 years of age he went to seek his fortune in the wilderness, and participated as a ranger or scout in the warfare with the Indians in Kentucky and Ohio, until the victory of Gen. Wayne in 1794 gave peace to the western country. About the commencement of the present century he settled in Ohio as a surveyor, and in 1805 became a member of the Ohio legislature, and was appointed major-general of the territorial militia. In the War of 1812 he received the commission of brigadier-general in the army, and succeeded General Harrison in 1814 in command of the army of the West. After the peace, as a joint commissioner with Gen. Cass, he negotiated the treaty with the Indians of Ohio for the sale of their lands in that State, which was ratified in 1818. He served again in the Ohio legislature 1815–21, and in 1823–5 was a representative in congress from that State. In 1830 he was elected governor of Ohio.

McArthur, Robert Stuart, American Baptist clergyman: b. Dalesville, Quebec, 31 July 1841. He was graduated from the University of Rochester, N. Y., in 1867, and from the Rochester Theological Seminary there in 1870, and from May 1870 to Sept. 1911 was pastor of Calvary Baptist Church, New York, when he resigned to go on a special mission to Russia. He was for a long period connected editorially with the 'Christian Inquirer' and 'Baptist Review,' and has lectured on foreign travel. His publications include: 'Calvary Pulpit'; 'Current Questions for Thinking Men'; 'Lectures on the Land and the Book'; 'Around the World'; 'Old Testament Difficulties.'

Macaulay, mạ-kâ'lĭ, **Catharine Sawbridge,** English historian: b. Wye, Kent, 2 April 1731, d. Binfield, Berkshire, 22 June 1791. In 1760 she was married to George Macaulay, a London physician. She was an ardent Republican, and a great admirer of Washington, with whom she corresponded, and whom she visited in 1785. She published a 'History of England from the Accession of James I. to the Revolution' (8 vols. 1763–71), once very popular, and eulogized by Pitt in the House of Commons, but now neglected.

Macaulay, James, Scottish novelist: b. Edinburgh 22 May 1817; d. there 20 June 1902. He was educated at the University of Edinburgh, and for 35 years was in the service of the Religious Tract Society as editor-in-chief. In 1851–7 he was joint editor of the 'Literary Gazette,' and in 1858 became editor of the 'Leisure Hour Sunday at Home.' 'The Boy's Own Paper' and 'The Girl's Own Paper' were founded by him. He was a voluminous writer, and among his published works the following may be mentioned: 'Across the Ferry; First Impressions of America and its People' (1871); 'Memory Helps in British History' (1873); 'All True: Records of Adventure' (1879); 'Luther Anecdotes' (1883); 'Gordon Anecdotes' (1885); 'Livingstone Anecdotes' (1886); 'Wonderful Stories of Daring, Peril and Adventure' (1887); and 'Victoria, Her Life and Reign' (1887).

Macaulay, Sir James Buchanan, Canadian jurist: b. Niagara, Ont., 3 Dec. 1793; d. Toronto 26 Nov. 1859. He was an ensign in the British army during the War of 1812, and subsequently studying law was admitted to the bar in 1812. In 1829 he was appointed a judge of the king's bench, from 1849 to 1856 he was chief justice of the court of common pleas, and just prior to his death became judge of the court of error and appeal. He was knighted in 1859.

Macaulay, Thomas Babington, English essayist, historian, and statesman: b. Rothley Temple, Leicestershire, 25 Oct. 1800; d. Holly Lodge, Kensington, 28 Dec. 1859.

Macaulay was the son of Zachary Macaulay, a Scotchman of remarkable character, who achieved distinction by his life-long advocacy of the abolition of slavery and his efficiency, as a young man, in the governorship of Sierra Leone, the colony of African freedmen. The family removed to Clapham, then a suburb of London, where much of Macaulay's youth was spent. Hannah More was a friend of the family, encouraged the lad as a writer and presented him with books to start his library. Young Macaulay was regarded as a prodigy, and his memory was something startling. He attended school near Cambridge under a Mr. Preston: his range of reading, particularly in poetry and fiction, was immense, while his taste for mathematics and the exact sciences steadily declined. In October 1818, he entered Trinity College, Cambridge, and in the citadel of mathematics his distaste for this study became pronounced. Twice he gained the Chancellor's medal for poetry, and he displayed classical attainments, but was «gulphed» in mathematics.

However, after a third trial, he won a Fellowship in 1824. His mental training was thus one-sided; and a certain lack of philosophical grasp and a dislike of facing abstruse intellectual problems became characteristic.

The association with his college mates, rather than his studies, left the deepest impression upon Macaulay. His great friend was Charles Austin, whose influence converted the young Tory into an uncompromising Whig. He shone in the Union Debating Society, developing powers that afterwards became conspicuous in the House of Commons. Politics he had heard discussed from early childhood in the circles which gathered round his father's table, and along with literature politics was his abiding passion. At college he had competed for a prize in history on the subject that attracted him years later: "The Conduct and Character of William III."

Before leaving the University he began writing for publication in *Knight's Quarterly Magazine*. Two lyrics, 'Ivry' and 'Naseby' still live; but the most important contribution was the ingenious 'Conversation between Mr. Abraham Cowley and Mr. John Milton, touching the great Civil War.' It seems likely enough that the freshness and delicacy of this early work became injured by the author's entrance into the rougher world of political strife. On the other hand it may be maintained that Macaulay's gifts were preëminently those of the man in public life, and to him literature, always a delight, was nevertheless really but an avocation.

Macaulay's father unexpectedly became financially involved. Full of courage, the son began tutoring while still at Cambridge and cheerfully assisted in supporting his sisters. Ultimately, together with his brother, he paid off all his father's obligations.

Macaulay was called to the bar in 1828 for the Northern circuit; but soon gave up the law for politics. Interestingly enough, his entrance into politics came by way of literature. In August 1825, appeared the essay on 'Milton,' the first of the series that Macaulay contributed to the *Edinburgh Review*, which, for the next 20 years, made both him and the *Review* famous. Jeffrey, the editor, expressed his frank wonder as to where Macaulay "picked up that style." Upon Jeffrey's resignation Macaulay was offered the editorship, but he was not willing to leave London. Papers on 'Machiavelli' (1827), 'Dryden,' 'History' and 'Hallam's Constitutional History' (1828), followed, and soon after controversial articles on James Mill, Sadler and Southey, which revealed the declared Whig. Their reputation introduced him into both social and political life. He was made Commissioner of Bankruptcy in 1828, and in 1830, Lord Lansdowne, hearing of the attack on Mill, offered Macaulay a seat in Parliament for Calne in Wiltshire.

The time of entrance into the House of Commons was propitious. It was just before the death of George IV. and the accession of William IV., and consequently on the eve of the battle for the reforms of 1832. Macaulay was 30 years of age, was widely read in history and literature, and was a ready and fluent speaker aflame with interest in public questions. In 1824 he had made a notable speech at a meeting of the Anti-Slavery Society; later, in the discussion for Catholic Emancipation, he headed a coachload of M.A.'s from London to Cambridge, arriving in time to vote down a petition in the University Senate against the Act. He now threw himself ardently into the struggle for the Reforms and took an honorable part in the fight from beginning to end. His parliamentary success was immediate. "Whenever he rose to speak," Mr. Gladstone testified, "it was a summons like a trumpet-call to fill the benches." His earliest effort was on the removal of the civil disabilities of the Jews, followed by an essay on the subject in the *Edinburgh Review* (January 1831). On the Emancipation of Slaves in the Colonies he never wavered, but stood unflinchingly true to his father's principles. He offered to resign his position with the ministry rather than yield his views on this subject; but the question was satisfactorily settled and his resignation not accepted.

Meanwhile he found time to write. The essays on 'Byron,' 'Johnson,' and 'Hampden,' appeared in 1831; 'Burleigh' and 'Mirabeau,' in 1832; 'War of the Succession in Spain' and 'Horace Walpole,' in 1833, and the first essay on 'Chatham,' January 1834.

As Secretary of the Board of Control Macaulay had interested himself in East Indian affairs, and in 1833, when the charter of the East India Company was renewed, he was offered a position on the East Indian Council with a salary of £10,000 per annum for five years. His brilliant career in Parliament was seemingly permanently endangered; but Macaulay did not hesitate. He could save half his salary and in five years have a competence. He needed money on account of the poverty of his father, for the sake of his two sisters, as well as for his own career; and he accepted, going out in 1834 and returning in 1838. The genius for government which the father had displayed at Sierre Leone, the son now manifested at Calcutta. His important permanent reforms were the creation of the Indian Penal Code and the Code for Criminal Procedure, achieved in the face of bitter local opposition, and the organization of a sound educational system.

Macaulay's family ties were very strong. A sister, Jane, had died in 1830, and his mother in 1831. One of his favorite sisters, Margaret, was married in 1832, an occurrence which he accepted as a source of personal distress. The other, Hannah, accompanied him to India, and there she met and was shortly married to Charles Trevelyan, an officer in the government service. Macaulay was much pleased with the match and the two households lived together under the same roof. Ever afterwards, as the young Trevelyans, his nieces and nephews, grew up, they became a very real part of Macaulay's life. His love for children, and particularly for these, was a marked trait, and one of them afterwards filially wrote his uncle's biography. Meanwhile his sister Margaret had died in England, and likewise his father died while Macaulay and the Trevelyans were on their homeward voyage. These deaths affected him deeply, and the home-coming was a sad one.

While in India he made opportunity for an immense amount of reading, particularly of the Latin and Greek classics, to which he returned with increasing delight. He also read widely in Italian and French, and did some German on the return voyage. His love for the great poets, dramatists, orators, and historians, affected his culture, his style, and his ideals. The lists of his reading from now to the end of his life become a part of his biography and would stock a good library. His long walks with a copy of Homer or Virgil, from which he was reading or spouting, became an accustomed sight. Thenceforward he determined himself to write a History in emulation of Thucydides and Tacitus and Livy, and his set speeches caught something of the spirit of Lysias and Cicero.

Upon his return to England he left for a tour in Italy, revelling in its beauties and associations with the enthusiasm of a first visit and the eye of an historian and student of Latin and Italian literatures. The literary fruits were the 'Lays of Ancient Rome.'

Returned home he sincerely hoped to begin his 'History of England,' which he planned to write from the Revolution of 1688 to the death of George III. Had he begun it immediately, with 20 years of life to devote to it, he might easily have left ten and more volumes covering the century instead of the first five extending through but 15 years — a brilliant fragment. But he was again dragged into politics, and Macvey Napier, editor of the *Edinburgh Review*, made heavy draughts upon his time.

In India he had contributed but two essays to the *Review*, that on 'Mackintosh's History' and the very long one on 'Bacon.' However, his experience furnished him the material for the brilliant narratives on 'Clive' (1840) and 'Warren Hastings' (1841). Besides these, in the six years after his return, he contributed 'Sir William Temple' (1838) — written in an entirely fresh spirit — 'Gladstone on Church and State' (1839), 'Von Ranke's History of the Popes' (1840), the 'Comic Dramatists of the Restoration' and 'Lord Holland' (1841), 'Frederick the Great' (1842), 'Mme. d'Arblay' and 'Addison' (1843), 'Barère' and the second essay on the 'Earl of Chatham' (1844). This, perhaps his noblest essay, proved to be his last. He was forced to give up writing in order to find time for his 'History.' His kindheartedness in yielding undoubtedly worked a detriment. But the entrance into politics was only in part due to the exigencies of his friends; for public life exercised a subtle fascination over him.

In 1839 he was elected member of Parliament for Edinburgh and was made Secretary at War with a seat in the Cabinet. Fortunately the ministry soon expired and his freedom from official duties gave him some leisure. He retained, however, his seat for Edinburgh, and his most important work was the Copyright Bill, which, after many radical suggestions, passed in almost the exact terms in which he advocated it.

In 1842 the 'Lays' appeared and achieved a great success despite the natural fears of friends. "Christopher North" of *Blackwood's*, who had attacked Macaulay on account of the Southey reviews, made up — on poetry they could agree. In 1843 the 'Essays' were collected and published. There had been a constantly growing demand for them which their author at first resisted. They had been written at odd moments of leisure and he regarded them as ephemeral, but copies were being introduced from America, and Macaulay had to consent. The sale proved their popularity was a permanent one. Macaulay's Essays still are unapproached of their kind, as condensed booklets of knowledge. An analysis of their contents shows how their author's mind was revolving constantly upon a definite period of English history — the Revolution and the consequent development under constitutional government, the subject he set for himself in writing his 'History' — and these are uniformly among his best. Those on foreign subjects and the controversial ones are less satisfying.

The 'History' had been delayed year after year for lack of leisure to begin actual work. At length the first two volumes appeared in 1848. They comprised the reign of James II. and the Revolution; but reproduced the setting as a whole and included details at once picturesque and dramatic as could only be drawn by a supreme master of narrative. Macaulay had set for himself high ideals; he wished to be read and to be understood; he sought to give a series of brilliant mental pictures; and he achieved what he set out to do. He is weakest, perhaps, on the side of ethical interpretation, in searching out the causes and setting forth the nexus of events; but his narrative is brilliant and effective. His faults are those of the man of culture in the world, as are his virtues — high-mindedness and a sense of personal honor and dignity. In opinions he represented the great middle class and the world of Whiggism and its mode of thinking: in many things Philistine; in some things, even vulgar; where mysticism and all esoteric systems of philosophy and kindred schools of poetry were accounted as foolishness.

The popularity of the 'History' was something enormous, surpassing even that of Byron's poems and of Scott's and Dickens's novels In 1849, in consequence of this success, Macaulay was made Rector of the University of Glasgow and Fellow of the Royal Society. He had been appointed Trustee of the British Museum in 1847. He declined a professorship of History at Cambridge, and steadily refused positions under the government which would take up his time.

He had represented Edinburgh in Parliament for eight years, when, in 1847, on account of his characteristic independence in voting for the Maynooth grant — for the maintenance of a Catholic university in Ireland — he offended many Edinburgh electors, and was not returned at the polls. He accepted his defeat with relief, and turned the more eagerly to the 'History.' In 1852 without any solicitation on his part, and with a steady refusal to give pledges, he was returned voluntarily by the electors of Edinburgh to his former seat. Under such circumstances he felt he could not refuse; but it aided in sapping his strength, and that year he had a spell of illness from which he never wholly recovered.

In 1853 his speeches were collected and published. In 1855 the third and fourth volumes of his 'History' appeared. Macaulay feared for their success after the splendid reception of the former two; but the new subject was the life and career of William of Orange, his favorite hero, he had worked hard to sustain himself, and 26,500 copies were sold in ten weeks. In 1857 he was made a peer, and chose the title, Baron Macaulay of Rothley, from his birthplace. Likewise this year he was made a foreign member of the French Academy, member of the Prussian Order of Merit, and High Steward of Cambridge. In 1858 he wrote five short biographies for the eighth edition of the Encyclopædia Britannica — Atterbury, Bunyan, Goldsmith, Johnson, and Pitt. These show greater compactness and maturity in judgment than his earlier treatment of the same themes.

In 1856 he left his bachelor quarters in town, at The Albany, and leased a pleasant villa, Holly Lodge, Campden Hill, Kensington. In 1859 his brother-in-law, now Sir Charles Trevelyan, was appointed Governor of Madras, and the thought of the separation bore heavily upon him. Fortunately his sister and the children remained behind a while longer. Macaulay had not been well for some time, and he died at Holly Lodge, 28 December. On 9 Jan. 1860, he was buried in Westminster Abbey in the Poets' Corner at the foot of Addison's statue.

A fifth volume of the 'History,' concluding the reign of William III., had been completed, and was edited posthumously by Lady Trevelyan. In 1876 appeared Macaulay's 'Life and Letters' by his nephew, George Otto Trevelyan.

A critical short biography is that of Mr. J. Cotter Morison ('English Men of Letters').

J. B. Henneman,
Professor of English in the University of the South.

McAuley, Catherine, Irish founder and first superior of the Sisters of Mercy: b. Stormont House, County Dublin, Ireland, 29 Sept. 1787; d. Dublin, 11 Nov. 1841. In childhood she was adopted by a wealthy Protestant family who allowed her to remain in the church of her father, the Roman Catholic, and left her a large fortune which she wished to use for the benefit of the poor. She first erected a commodious house wherein might be taught a number of poor children, and where homeless young women might find lodging and board. This institution was opened in Dublin, 24 Sept. 1827, but the religious order was not established until 12 Dec. 1831. The members of the order take the vows of poverty, chastity, and obedience; and the works which they perform are visiting the poor, sick, and imprisoned, teaching, establishing hospitals, orphanages, homes for the friendless and other works of mercy. There are houses of her order in nearly all parts of the world. In the United States it comprises about 6,000 members. The order includes a college for young women, at Mount Washington, Md., a large number of academies, high and elementary schools, and hospitals and orphanages in nearly every State in the Union. Consult: Hartnett, 'Memoir of Mother McAuley'; Murphy, 'Sketches of Irish Nunneries'; Member of Order of Mercy, 'Life of Catherine McAuley.'

Maçayo, mä-sī-ō', Brazil. See Maceio.

Macbeth', or **Macbethad, MacFinlegh,** king of Scotland who reigned from 1040 to 1057. The facts of his life, so far as known, are these. During the reign of Duncan he was "mormaer" of Moray by inheritance, and by his marriage with Gruoch, grand-daughter of Kenneth IV. Duncan, in his attempt to subdue the independent chiefs of the north, was slain by Macbeth at Bothgowan, supposed to be near Elgin. By this means Macbeth became king, and, according to accounts, his reign was fairly successful. He was finally defeated in battle and slain by the sons of Duncan at Lumphanan, Aberdeen (1057). The legends which gradually gathered round the name of Macbeth were collected by John of Fordun and Hector Boece, and reproduced by Holinshed in his 'Chronicle.' These writers appear to have overlooked the excellent qualities of Macbeth as king, and regarded him with horror as a usurper. Consult: Robertson, 'Scotland under her Early Kings' (1862); Skene, 'Celtic Scotland' (1876–80).

Macbeth, a tragedy by Shakespeare, written about 1605, and printed in the first folio edition of Shakespeare 1623. See preceding.

McBurney, măk-bėr'nĭ, **Charles,** American surgeon: b. Roxbury, Mass., 17 Feb. 1845. He was graduated at Harvard in 1866; and from the Columbia Medical School in 1870, and has since practised his profession in New York. He was professor of surgery in the College of Physicians and Surgeons, New York, and has been visiting and consulting surgeon at St. Luke's, the Presbyterian, Roosevelt, New York Orthopedic, and other hospitals. When President McKinley was shot, Dr. McBurney was summoned to Buffalo as consulting surgeon.

McBurney, Robert Raikes, American religious worker: b. Castleblaney, Ireland, 31 March 1837; d. Clifton Springs 27 Dec. 1898. He came to the United States in 1854, and from 1862 was the general secretary of the New York Young Men's Christian Association. He was devoted to his work, and with the progress of years came to be recognized as the leading Y. M. C. A. secretary in the world.

McCabe, ma-kāb', **Charles Cardwell,** American Methodist bishop: b. Athens, Ohio, 11 Oct. 1836; d. New York 19 Dec. 1906. He was educated at Ohio Wesleyan University. In 1860 he entered the Methodist Episcopal ministry, and in 1862 was appointed chaplain of the 122d Ohio Infantry. At the battle of Winchester he was captured, and held in Libby prison for four months, and soon after his release entered the service of the United States Christian Commission and succeeded in raising a large amount of money for its work. Later he became financial agent for Wesleyan University; and in 1884 was made secretary of the Methodist Episcopal Missionary Society. He was remarkably successful in raising large amounts of money for missionary purposes. He became a bishop of his Church in 1896, and in December 1902 was elected chancellor of the American University at Washington, D. C.

Maccabees, măk'a-bēz, two books of the Scriptures considered by the Roman Catholic Church as inspired, and therefore included in the canon. The Protestant bodies hold them to be of high historic value, but at the Reformation they were excluded from the canon as not to be considered a part of the inspired Word of God. They are, therefore, classed in the Apocrypha (q.v.). They were also excluded from the Jewish canon, as well as from that of the

Greek Church, and while the Church of England allows them to be read aloud in public worship, it declares in Article VI. these «books» . . . «the Church doth read for example of life and instruction of manners; but yet doth not apply them to establish any doctrine.» The main objection made by Protestants to their canonicity seems to be that they favor prayers for the dead, as in the passage Macc. xii. 45.

The books of the Maccabees are of high interest, and record in a tone of lofty enthusiasm the heroic struggle of the Jewish people to maintain their independence against overwhelming odds. The political object of this struggle was ever of less importance to them than their religious object, namely, to vindicate the sanctity of the temple and the integrity of Jewish Levitical worship. The circumstances under which this struggle took place may be summarized as follows: When the whole East as far as the Punjab and the Indus had fallen subject to the arms of Alexander the Great, it is related that after conquering Syria in its northern and Phœnician territories, and taking Tyre and Sidon, he projected a southern campaign against the Jews, whose fertile territory and wealth had attracted his notice. Then, it is said, he saw a vision of the high priest Jaddua coming out to meet him on his march. He persisted, says Josephus, in continuing this expedition against Jerusalem, but when he approached the sacred city his vision came true, which so impressed him with superstitious awe that he made a treaty with the Jews, and turned back from his purpose of sacking the city of Zion, and wasting the country. In 323 Alexander died at Babylon and the Diadochi divided among themselves the area of his conquest. Syria fell to the lot of the Seleucidæ, one of whom, Antiochus Epiphanes, formed a design to extend his kingdom by the conquest of Palestine. On completing this design he showed himself as hostile to the Hebrew religion as he had been to their national independence.

The Hebrews might have tolerated the introduction of the Greek language into their homes and markets, or even of some Greek customs and laws. But when Antiochus proceeded to a high handed defiance of their religious beliefs and observances, they felt that the honor of God, the sacredness of the law, the sanctity of the temple, were to be vindicated. Their deep-seated and hereditary fanaticism was awakened and when they saw the image of Zeus set up in the holiest place, and the Jewish ritual abolished they entered upon that struggle which is related in the books of the Maccabees.

The date of that act of desecration by which pagan worship was instituted in the temple of Jehovah is the 25th of the month Chisleu (December) 168 B.C. Soon after this a champion of Jehovah arose in the village of Modin. A certain priest named Mattathias refused to sacrifice according to the Greek rite, and actually headed an insurrection against the officials of the government. A long series of patriotic wars ensued. The Syrian king found stubborn antagonists in the five sons of Mattathias, John, Simon, Judas, Eleazar and Jonathan, who were the generals of the Jewish armies. But although they are collectively styled Maccabees, the name is only proper to one, the greatest of them, Judas, who by his skill and intrepidity led on his countrymen from night attacks and sudden surprises to more open and important operations; and at length defeated Apollonius and Seron, who had marched to the attack with greatly superior forces, at Bethhoron, in the plain of Esdraelon, the battle-field of Palestine and the scene of some of the most glorious victories in Jewish annals. Lysias, the lieutenant of Antiochus, headed an expedition against the patriots, but Judas encountered him, and defeated him with signal loss. Judas now occupied Jerusalem, purified the temple three years after its profanation, and re-inaugurated the holy service. The anniversary day of this re-inauguration was afterward called the «Feast of the Dedication,» and kept with solemn observances (John x. 22). Despite his successes the position of Judas was anything but secure, and in 163 B.C. Lysias took Bethsura, and laid siege to Jerusalem. He had guaranteed to the Jews the liberty of their religion; but he was put to death by Demetrius, a new claimant of the crown, who sent Nicanor against Judas. The Jewish leader defeated him first in a battle at Capharsalama, and then with total ruin at Adasa, but feeling the difficulty of continuing the contest against the whole power of the Syrian empire, solicited an alliance with the Romans. A Syrian army again invaded Palestine, before aid could reach him from his new allies. To 22,000 Syrian troops, led by Bacchides, Judas could oppose only 3,000. Though these had gradually diminished to 800 he resolved to attack the invaders, and after a desperate struggle he fell fighting with useless valor, 161 B.C. Judas derived his name from *Makkava,* a hammer, for he dealt many heavy blows to Syrian paganism. So Charles Duke of Austria, son of Pepin d'Heristal, was styled Charles the Hammer (Martel) for his defeat of the Saracens between Tours and Poitiers. The Maccabees have always been looked upon as the national heroes of the Jews, and they are reckoned as saints on the calendar of the Greek Church, and venerated as such.

Maccabees, Knights of the Modern. See KNIGHTS OF THE MODERN MACCABEES.

Maccabees, Ladies of the. See LADIES OF THE MACCABEES OF THE WORLD.

Maccabees, Ladies of the Modern. See LADIES OF THE MODERN MACCABEES.

Maccabees of the World. See KNIGHTS OF THE MACCABEES OF THE WORLD.

McCall, mạ-kâl', **George Archibald,** American soldier: b. Philadelphia 16 March 1802; d. 25 Feb. 1868. He was graduated at West Point in 1822; in 1846 reached the rank of captain, and that of colonel in 1850. Having served against the Seminoles in Florida, he won distinction in the Mexican War; in 1850 he became inspector-general, resigning from the army three years later. In 1861 he was given command of the Pennsylvania Reserves, with the rank of brigadier-general of volunteers, and participated in the work of the Army of the Potomac, particularly in the Peninsular campaign of 1862, in which he was engaged with his troops at Mechanicsville, Gaines' Mill, and Frazier's Farm (qq.v.). At Frazier's Farm, 30 June, he was taken prisoner, and was confined for several weeks in Libby prison. In August he was exchanged, but impaired health prevented him from returning to the army, and in 1863 he resigned. He wrote 'Letters From the Frontier' (1868).

McCal'la, Bowman Hendry, American naval officer: b. Camden, N. J., 19 June 1844; d. Santa Barbara, Cal., 6 May 1910. He was graduated at the United States Naval Academy in 1864, and rose to captain in 1898. In 1890 he was court-martialed on charges of cruelty to his subordinates and was suspended for three years, but in consideration of previous acts of gallantry was restored to active service in 1891. He commanded the Marblehead during the war with Spain in 1898 and was subsequently restored to the place he held on the list of officers previous to his suspension. In 1899 he commanded the Newark and aided in the pacification of the Philippines. In 1900 he co-operated with Vice-Admiral Seymour in putting a stop to the Boxer troubles at Peking. In 1901 he was given command of the Kearsarge; in 1905 became commandant of the Mare Island Navy Yard and was retired 19 June 1906.

McCam'mon, Joseph Kay, American lawyer: b. Philadelphia 13 Oct. 1845; d. 2 Jan. 1907. He graduated at Princeton in 1865; studied law; became register in bankruptcy in 1870; was special counsel of the United States in Washington, 1871; president of the board for investigation of the Indian service, 1877; assistant attorney-general of the United States, 1880–5; and in 1881 was appointed United States commissioner of railroads. Under Presidents Garfield and Arthur, he conducted treaties with various Indian tribes. Among his writings are a 'Report on Indian Service' (1878); 'Report of Councils with Bannock and Shoshone Indians' (1881); 'Report of Councils with Flathead and Other Indians' (1882); 'Arguments in Cases Affecting Pacific and Other Railroads.'

McCarthy, ma-kär'thĭ, Justin, Irish author and politician: b. Cork, Ireland, 22 Nov. 1830; d. 24 April 1912. He became connected with the Liverpool press in 1853 and in 1864 was made editor-in-chief of the Morning *Star*. He represented the Home-Rule party in Parliament. His stay in the United States extended from 1868 to 1870, during which period he was for some time connected editorially with the New York 'Independent.' His main work is 'History of our Own Times' (1879–80); but he has also written: 'History of the Four Georges' (1889), and his novels include: 'Lady Judith' (1871); 'A Fair Saxon' (1873); 'Dear Lady Disdain' (1875); 'The Right Honorable' (1886 with Mrs. Campbell-Praed). Later he has published 'The Story of Gladstone's Life' (1897); 'Modern England' (1898); and 'Reminiscences' (1898). He enjoyed a pension from the British government for his "services to literature."

McCarthy, Justin Huntley, Irish journalist and author: b. 1860. He was graduated at University College and in 1884 was elected to Parliament. He has been a prolific and versatile author, following in the footsteps of his father Justin McCarthy (q.v.). Among his works are 'Outline of Irish History' (1883); 'Serapion, and Other Poems' (1883); 'England Under Gladstone' (1884); 'Camiola, a Girl with a Fortune' (1885); 'History of the French Revolution' (1897); 'The Proud Prince' (1903); 'The Dryad' (1905). He has also written plays, such as 'The Candidate'; 'The White Carnation,' and 'If I Were King.'

McCaul, ma-kâl', John, Canadian scholar: b. Dublin, Ireland, 1807. He was elected president of Toronto University in 1849 and was interested for many years in educational matters in Canada. He edited Horace, Longinus, Lucian and Thucydides as college text-books, and among his valuable archæological works are 'Britanno-Roman Inscriptions' (1863); and 'Christian Epitaphs of the First Six Centuries.'

MacCauley, ma kâl'ĭ, Clay, American Unitarian clergyman and author: b. Chambersburg, Pa., 8 May 1843. He was graduated at Princeton in 1864, and at the Theological Seminary of the Northwest, Chicago, in 1867, and read philosophy and divinity at Heidelberg, 1872. In the Civil War, 1862–3, he was a lieutenant in the 126th Pennsylvania regiment, and served on the staff of Gen. S. D. Sturgis, and in 1864–5 was a member of the Christian Commission in the United States army. In 1880–1 he was a collaborator of the Bureau of Ethnology among Indians east of the Mississippi. Entering the Unitarian ministry, he was pastor of the First Church, Waltham, Mass., 1869–72, and of All Souls Church, Washington, D. C., 1876–81. From 1890 to 1900 he served as director of the Japan mission of the Unitarian Association, and from 1891 to 1899 was president of the College for Advanced Learning at Tokyo and professor there of philosophic and historic theology. He has written: 'Christianity in History' (1891); 'The Religious Problem of Japan — How Solve It?' (1894); 'Introductory Course in Japanese' (1896); 'Japanese Literature' (1899); 'A Day in the Very Noble City, Manila' (1899); and has published 'Single Songs of a Hundred Poets' (1899) and other translations from the Japanese.

McCausland's Raid, an incursion of the Confederate general McCausland into Maryland and Pennsylvania, the chief incident of which was the burning of Chambersburg, Pa. Gen. Early having defeated Gen. Crook in the battle of Kernstown (q.v.), 24 July 1864, and driven him and Averell across the Potomac at Williamsport, ordered Gen. McCausland with his brigade and that of Bradley T. Johnson, with four guns, in all about 2,300 men, across the Potomac to raid Pennsylvania and then move to Cumberland, Md., to destroy the machinery of the Cumberland coal-pits and the repair-shops, stations, and bridges of the Baltimore & Ohio Railroad. Early says he wished to open the eyes of the people of the North to the enormities of its armies, by an example in the way of retaliation, and that Chambersburg, Pa., was selected as the town on which retaliation should be made. The sum of $100,000 in gold, or $500,000 in currency was to be demanded of it, in default of which McCausland was ordered to burn the town. Under cover of demonstrations at Williamsport and other points along the Potomac, McCausland crossed the river at McCoy's Ferry, near Clear Spring, above Williamsport, on the 29th, and made straight for Chambersburg, about 25 miles northeast. He met with but little opposition and, on the morning of the 30th, rode into the fated town and demanded the sum fixed by Early. It could not immediately be raised; he knew that Gen. Averell was close upon him; and setting fire to the place, laying a greater part of it in ashes, he hastily marched westward to Mc-

Connellsburg and encamped. Averell, who was in Hagerstown when he heard that McCausland had crossed the Potomac, started in pursuit with about 2,600 cavalry, went through the burning town and, a few miles from McConnellsburg, struck McCausland's rear, diverting him from his intended march on Bedford and forcing him back to the Potomac at Hancock, which was reached by noon of the 31st. Here McCausland formed for battle, but upon Averell's appearance and prompt attack he withdrew westward by the National road to Cumberland, where, 1 August, he found Gen. Kelley to oppose him, whom he attacked in the afternoon, and skirmished until night, when he retreated toward Old Town, on the Potomac, leaving 30 of his killed and wounded on the field. At Old Town he forced a crossing at daylight 2 August, capturing or dispersing a regiment of new troops from Ohio, and then moved south into the Valley of the South Branch of the Potomac, by way of Springfield and Romney. From Romney, 4 August, he moved on New Creek and attacked the garrison, but after a stubborn fight was respulsed, leaving 25 dead on the field, the Union loss being 36 killed and wounded. McCausland then withdrew to near Moorefield, where the South Fork joins the South Branch of the Potomac, and considering himself safe from pursuit, went into camp. Averell, who had remained at Hancock when McCausland drew off toward Cumberland, crossed the Potomac on the 4th, and, after a forced march through Bath, Springfield, and Romney, before sunrise of the 7th surprised McCausland in his camp and routed him, capturing his four guns, nearly all his wagons, several hundred horses, three battle-flags, many small arms, and 420 prisoners, including 38 officers. McCausland's loss in killed and wounded was about 100. Averell's loss was 41 killed and wounded. McCausland's shattered command fled to the mountains, and made its way in squads to the Shenandoah Valley, finally assembling at Mount Jackson. "This affair," says Early, "had a very damaging effect upon my cavalry for the rest of the campaign." Consult: 'Official Records,' Vols. XXXVII., XLIII.; Pond, 'The Shenandoah Valley in 1864'; Early, 'The Last Year of the War for Independence.'

E. A. CARMAN.

MacChes'ney, Clara T., American artist: b. Brownsville, Cal., 1861. She studied at the San Francisco Art School, at the Gotham Art School, New York, and at the Colarossi School in Paris. Her genre work has received favorable recognition. At the World's Columbian Exposition in 1893 she was awarded two medals and she received the Dodge prize, New York, in 1894. Since then she has also received three medals from the Colarossi School, a gold medal from the Philadelphia Art Club, and the second Hallgarten prize from the National Academy of Design, New York. At the Paris Exposition of 1900 she exhibited 'Pomegranates' and 'The Old Blind Fiddler.'

McChesney, Dora Greenwell, American author: b. Chicago 1 Oct. 1871. She was privately educated, chiefly by her mother, in whose company she traveled and read widely, making special acquaintance with German literature, Italian art, and Roman antiquities, also becoming deeply interested in studying the English civil war, with characters and incidents of which her writings largely have to do. Among these are: 'Kathleen Clare, Her Book, 1637-1641' (1895); 'Miriam Cromwell, Royalist: a Romance of the Great Rebellion' (1897); 'Beatrix Infelix: a Summer Tragedy in Rome' (1898); 'Rupert, by the Grace of God: the Story of an Unrecorded Plot' (1899).

Macchiavelli, Niccolo. See MACHIAVELLI, NICCOLO.

McClellan, mạ-klĕl'an, **George Brinton**, American soldier: b. Philadelphia 3 Dec. 1826; d. Orange, N. J., 29 Oct. 1885. He was educated at the University of Pennsylvania and at West Point where he was graduated in 1846. He was brevetted 2d lieutenant of engineers, and immediately ordered to Mexico, where as lieutenant of a company of sappers, miners, and pontoniers he rendered valuable service. He was at the siege of Vera Cruz, at Cerro Gordo, and in the attack on the City of Mexico; at Contreras and Churubusco he won the brevet of 1st lieutenant, and was brevetted captain for gallantry at Chapultepec. After the war he was ordered to West Point as captain of field labors and instructor in bayonet exercise. In 1851 he was ordered to Fort Delaware to superintend its construction. The next year he accompanied Capt. Randolph B. Marcy (later his father-in-law) on an expedition to explore the Red River, and in September 1852 was ordered as senior engineer to Texas, to survey the rivers and harbors of that State. In 1853 he was detailed for the examination of the western part of the proposed route for a Pacific railroad; and explored the Yakima pass and various portions of the Cascade range, and the most direct route to Puget Sound, his report forming the 1st volume of the 'Pacific Railroad Surveys' published by the government. He was soon afterward detailed to investigate the railroad system of the United States, with a view to obtain all the necessary data on construction, equipment, and management for the successful operation of the Pacific railroad. Of the result of his proceedings he presented a full report in November 1854. In March 1854 he was promoted to be captain in the 1st cavalry In the spring of 1855 he was sent to Europe to study the organization of European armies, and observe the war in the Crimea. He wrote one volume of the report of this commission, which was republished in Philadelphia under the title of 'The Armies of Europe' (1861). He resigned his commission in January 1857, and was for three years vice-president and engineer of the Illinois Central Railroad, at the end of which time he became general superintendent of the Ohio and Mississippi Railroad, and two months later president of the eastern division of the same road. He held this office when the Civil War broke out in 1861. He then received a commission as major-general from the governor of Ohio and proceeded to organize the volunteers of the State; the States of Ohio, Illinois, Indiana, the western part of Pennsylvania and western part of Virginia were united to form the department of the Ohio under his command. About 1 June his army began to cross the Ohio River into Virginia; on the 18th McClellan himself left Cincinnati to take the field, and by the middle of July the whole northwestern part of the State had been cleared of Confederate troops and the Wheeling legislature left free to organize a loyal government.

On 22 July, McClellan was summoned to Washington to take command of the Army of the Potomac, and commissioned as major-general of the United States army. On his arrival at Washington, he found everything in disorder and the troops badly demoralized in consequence of the defeat at the first battle of Bull Run, and devoting himself to the organizing and disciplining of his army, he soon brought order out of chaos, and had his troops well equipped and in excellent condition. On the retirement of General Scott from active service, McClellan was appointed general-in-chief of the armies of the United States. Plans were then taken under discussion for an attack upon Richmond, and here difference of opinion arose between the President and the Secretary of War and McClellan; the plan finally accepted made the base of supplies on Chesapeake Bay, with line of march upon Richmond from the Peninsula. The army did not move until March 1862, and in the meantime discontent had arisen at Washington on account of the delay. On 10 March the army advanced toward Manassas, but as the Confederates had evacuated that place and had fallen back upon Richmond, the real campaign was begun by transporting the troops to Fortress Monroe. On 11 March, some two weeks before leaving Washington, McClellan was deprived of the chief command, leaving him the command of only the Army of the Potomac; McDowell's corps and other reinforcements on which he had relied were also removed from his army for the defense of Washington. He besieged Yorktown for a month, though opposed by a much inferior Confederate force, whose numbers he greatly overestimated; when Yorktown was evacuated 4 May, he advanced toward Richmond, defeating the Confederates at Williamsburg and Hanover Court House. After reaching the Chickahominy, he found his lines too extended to protect from attack and advance upon Richmond, and decided to retreat to the James River; then followed the Seven Days' Battles which ended when the Federal Forces reached Hampton's Ferry. From here McClellan had planned a new advance, but dissatisfaction against him was so strong that he was relieved from his command, and ordered to evacuate the peninsula. (See PENINSULAR CAMPAIGN.) He was then put in command of the fortifications of Washington, till after the second battle of Bull Run. when he succeeded General Pope, again taking command of the Army of the Potomac. On Lee's invasion of Maryland, McClellan marched to attack him, and fought the battle of Antietam (q.v.) forcing the Confederates to retreat from their position and following them as far as the Potomac. He did not, however, cross the Potomac in pursuit, as he was awaiting supplies; this failure to follow up his victory caused him to be deprived of his command, and he was ordered to Trenton, N. J. He took no further part in the war.

In 1864 he was Democratic nominee for President of the United States, and was defeated, the electoral vote stood 212 for Lincoln against 21 for McClellan, but McClellan's popular vote was 1,800,000. He remained abroad from 1864–8, and on his return had charge of the construction of the Stevens' floating battery, which, however, was not completed on account of financial difficulties. In 1870 he was appointed chief engineer of the department of docks for New York city, in 1877 he was elected governor of New Jersey, and during his administration reduced and finally abolished the State tax, improved the system of public education, and built up an effective militia; he declined a renomination. As a general, McClellan won the confidence and aroused the enthusiasm of his soldiers to an unusual degree; he excelled as an organizer of armies, and had a thorough knowledge of the science of tactics, as shown in his plans of campaign, but in actual campaigning lacked aggressiveness and the power to act quickly and take advantage of his enemy's mistakes. He wrote besides the reports mentioned 'Manual of Bayonet Exercise' (1852) and 'Report on the Organization and Campaigns of the Army of the Potomac' (1864). Consult: 'McClellan's Own Story,' edited by W. C. Preine, and Michie, 'General McClellan' ('Great Commander' series).

McClellan, George Brinton, American politician: .b. Dresden, Saxony, 23 Nov. 1865. He is the son of General G. B. McClellan (q.v.). He was graduated from Princeton in 1886; and took up journalism, working as a reporter and in editorial positions for several of the New York city dailies. He studied law, and was admitted to the bar in 1892. From 1889 to 1892 he was treasurer of Brooklyn Bridge. Early active in politics as a Democrat, he was elected to the board of aldermen, and was president of that board in 1893 and 1894. He was elected to Congress in 1894, and for four succeeding terms, and was a member of the House Committee of Ways and Means. In Congress he has been an advocate of tariff reform and free trade, and though opposed to an imperialistic policy, did not sympathize with the attacks on the conduct of the United States army in the Philippines. In 1903 he was nominated for Mayor of Greater New York by the regular Democratic organization (Tammany Hall), and was elected by 63,000 majority. In 1905 he was again elected Mayor by 3,472 plurality.

McClel'land, Robert, American lawyer: b. Franklin County, Pa., 1807; d. Detroit, Mich., 30 Aug. 1880. He was graduated at Dickinson College, Pa., and subsequently practised law at Pittsburg, Pa., but in 1833 emigrated to Michigan, and entered into commercial business in Monroe. His political life was soon afterward begun, for in 1835 he was elected to the State legislature, and to Congress in 1843. He became governor of Michigan in 1852, and in 1868 was a member of the Democratic National Convention which nominated Seymour and Blair.

McClernand, ma̤-klĕr'na̤nd, **Edward John,** American soldier: b. Jacksonville, Ill., 29 Dec. 1848. In 1870 he was graduated at West Point and stationed on the Western frontier for the nine following years, in which he did rescue work after the destruction of Custer's command, and had a share in the capture of Chief Joseph and the Nez Percés Indians. In 1898 he was appointed lieutenant-colonel and adjutant-general of volunteers, served with the Army of Santiago de Cuba in 1898, and was ordered to the Philippine Islands, where he routed the insurgents at Cebu, 8 Jan. 1900. He was subsequently put in command of the 2d district in the Department of the Visayas, including the islands of Cebu, Mactan, Baulayan and the Camotes.

McClernand, John Alexander, American lawyer: b. Breckinridge County, Ky., 30 May 1812; d. Springfield, Ill., 20 Sept. 1900. He was admitted to the Kentucky bar in 1832, but in the same year volunteered for military service against the Sac and Fox Indians. Five years later he was elected to the Illinois legislature, and subsequently sat for two terms in Congress. During the Civil War he served with distinction at the battle of Fort Donelson as brigadier-general of volunteers, and was promoted major-general. He led a division at the battle of Shiloh, relieved Sherman before Vicksburg in 1863 and was in command of the 13th Army corps until 1864, when he resigned. In 1870 he was appointed circuit judge for the Sangamon, Ill., district. He presided at the National Democratic convention in St. Louis, 1876, and was appointed by President Cleveland member of the Utah Commission.

McClintock, mạ-klĭn'tŏk, **Emory,** American actuary: b. Carlisle, Pa., 19 Sept. 1840. He was graduated from Columbia University in 1859, and afterward took special studies in chemistry. He was consular agent at Bradford, England, 1863–6, actuary of the Asbury Life Insurance Company, New York, 1867–77, and of the Northwestern Mutual Life Insurance Company, Milwaukee, 1871–89. Since the last named date he has been actuary of the Mutual Life Insurance Company, New York. He has contributed to mathematical journals.

McClintock, Sir **Francis Leopold,** English admiral: b. Dundalk, Ireland, 1819; d. 17 Nov. 1907. He entered the British navy in 1831 and was commissioned lieutenant in 1845. He sailed on four Arctic voyages, being sent out in 1848 to search for Sir John Franklin, and again in 1850 and 1852, without discovering any traces of the explorer. In 1857 he renewed the search as commander of the Fox and brought back documentary and other evidence of Franklin's death. For his services as an Arctic explorer he was knighted in 1860, and in 1844 made admiral. He wrote 'Voyage of the Fox.'

McClintock, John, American scholar: b. Philadelphia, Pa., 27 Oct. 1814; d. Madison, N. Y., 4 March 1870. He was joint editor and compiler with James Strong of the 'Cyclopedia of Biblical, Theological and Ecclesiastical Literature' which goes by their name, the last volume of which was published in 1895. Among his other works are 'An Analysis of Watson's Theological Institutes' (1850); and 'Temporal Power of the Pope' (1853). For the last three years of his life he was president of the Drew Theological Seminary.

McCloskey, mạ-klŏs'kĭ, **John,** American Roman Catholic prelate: b. Brooklyn, N. Y., 20 March 1810; d. New York 10 Oct. 1885. His secondary and collegiate studies were made at Mount Saint Mary's College, Emmitsburg, Md., and his post-graduate studies in France and Rome. At 24 he was ordained priest and on returning to America was assigned to Saint Joseph's Church, New York city. When Saint John's College, at Fordham (now a part of New York city), was opened in 1841, he was made its first president, but in the next year he returned to parish work. In 1844 he was appointed coadjutor to Bishop Hughes of the diocese of New York, and consecrated titular bishop of Axieren; and three years later was appointed bishop of Albany, a diocese just created from a part of the diocese of New York. For 17 years he worked for the upbuilding of the Albany diocese, and the good of his people. He built the Cathedral of the Immaculate Conception at Albany, Saint Joseph's Theological Seminary at Troy, established several new parishes, and founded educational and charitable institutions, including hospitals, orphanages, homes for the aged, and reformatories. He succeeded Archbishop Hughes in the archiepiscopal see of New York, 6 May 1864. The result of his labors in the archdiocese of New York remains his greatest monument. He was made a cardinal in 1875, under the title of Santa Maria supra Minervam. He was in attendance at the Vatican Council (q.v.) and a member of the committee on discipline. He was summoned to Rome February 1878 to attend the conclave for the election of a pope but was too late to cast a vote, Leo XIII. having been elected a few hours before his arrival. Cardinal McCloskey was noted for his gentleness, firmness, profound scholarship, and great executive ability.

McCloskey, William George, American Roman Catholic prelate: b. Brooklyn, N. Y., 10 Nov. 1823; d. 17 Sept. 1909. Upon completing his studies at Mount Saint Mary's College, he turned to the law, but subsequently entered Saint Mary's Theological Seminary, where he pursued a six years' course in philosophy and theology, being ordained priest 6 Oct. 1852. His first appointment was as assistant in the Church of the Nativity. In 1853 he was named professor of Latin and Sacred Scriptures in Mount Saint Mary's College and in 1857 became director of the theological seminary. When the American College was formally opened in Rome Pope Pius IX. chose Dr. McCloskey its first president, 8 Dec. 1859, a position which, for eight years, he filled to the utmost satisfaction. In 1865 he visited America in the interests of the institution under his charge and succeeded in collecting funds sufficient for its permanent endowment. Upon the death of Bishop Lavialle, Pope Pius IX. appointed Dr. McCloskey to the see of Louisville, Ky., and he was consecrated at Rome 24 May 1868. During his 36 years' administration numerous churches, schools and religious institutions were built throughout his diocese, which now has a Catholic population of over 100,000; 175 priests; 150 churches; 60 parochial schools, giving instruction to many thousands of pupils, besides orphanages, hospitals, infirmaries, academies, etc.

McClure, mạ-kloor', **Alexander Kelly,** American journalist: b. Sherman's Valley, Perry County, Pa., 9 Jan. 1828. He was reared on a farm, educated at home, and apprenticed to a tanner in 1842, soon after began to write for the Perry *Freeman,* and edited and published the *Juniata Sentinel* at Mifflin, Pa., in the Whig interest, 1846–50. He then published (1850–6) the Chambersburg *Repository,* which he made influential in the cause of anti-slavery. He was State superintendent of printing in 1855; a member of the State convention of 1855 which met at Pittsburg to organize the Republican party; in 1856 was admitted to the bar, and was a delegate to the first Republican national convention in Philadelphia. In 1857–8 he sat in the legislature as a Republican, and was State senator in 1859. As leader of the Pennsylvania delegation in the Republican national convention of 1860 he aided in the nomination of Abraham Lincoln. In 1862–4 he again published the Chambersburg *Repository*, and in the latter year served as assistant adjutant-general in charge of the draft in Pennsylvania. Two years later he was again a member of the legislature, and in 1868–73 practised law in Philadelphia. He was chairman of the State delegation to the Liberal Republican convention in 1872, and of the Liberal Republican State Committee, and in that year entered the State senate. In a close election in 1873 he was defeated as an independent candidate for mayor of Philadelphia. In 1875 he established the Philadelphia *Times*, of which he was editor-in-chief till 1891. He has published 'Three Thousand Miles Through the Rocky Mountains'; 'Our Presidents and How We Make Them' (1901); 'Recollections of Half a Century' (1902); etc.

McClure, James Gore King, American Presbyterian clergyman: b. Albany, N. Y., 24 Nov. 1848. He was graduated at Yale in 1870, at the Princeton Theological Seminary in 1873, and ordained as a Presbyterian minister in 1874. He was settled (1874–9) at New Scotland, N. Y., and has been pastor at Lake Forest, Ill., since 1881. From 1897 to 1901 he was president of Lake Forest University. He has written 'Possibilities' (1896); 'The Man Who Wanted to Help' (1897); 'The Great Appeal' (1898); 'Environment' (1899); 'For Hearts that Hope' (1900); and 'A Mighty Means of Usefulness' (1901); etc.

McClure, Sir **Robert John Le Mesurier,** English admiral: b. Wexford, Ireland, 28 Jan. 1807; d. London 17 Oct. 1873. He began his naval career in 1824, and in 1836 under Sir John Ross made his first voyage to the Arctic regions. Again he joined an expedition sent to discover the North-West Passage in 1848. Two years later he was placed in command of an Arctic expedition and discovered Prince of Wales Strait, which connects the Atlantic and Pacific. On his return he was knighted. From his journals was published 'The Discovery of the North-West Passage' (by Captain Sherard Osborne, 1856).

McClure, Samuel Sidney, American editor and publisher: b. in County Antrim, Ireland, 17 Feb. 1857. He was graduated at Knox College, Galesburg, Ill., in 1882. In 1884 he established a newspaper syndicate which has grown to great proportions and assumed distinctive importance in the publishing world. In 1893 he founded 'McClure's Magazine,' and in 1899 established the publishing house of McClure, Phillips & Company, New York. He is also president of the S. S. McClure Company in the same city. Since 1894 he has been a trustee of Knox College.

McClurg, ma-kloorg', **Alexander Caldwell,** American publisher: b. Philadelphia 1834; d. St. Augustine, Fla., 15 April 1901. He was graduated at Miami University, Oxford, Ohio, in 1853, engaged in business with S. C. Griggs & Company, publishers, in Chicago, and in 1862 entered the Union army. He was captain in the 88th Illinois regiment of infantry, rose to the rank of colonel, was made brevet brigadier-general, and in the Atlanta campaign and during Sherman's great march served as chief of staff to the 14th corps. Returning from the war, he was admitted to partnership in the publishing house above mentioned, and some years later established the firm of Jansen, McClurg & Company, afterward A. C. McClurg & Company. The business of the house prospered, and in 1899 the company was reorganized, the co-operative principle adopted, and the employees, among whom the stock was largely distributed, were granted easy terms for increasing their investments.

MacColl, mạ-kŏl', **Evan,** Canadian poet: b. Kenmore, Argyleshire, Scotland, 21 Sept. 1808; d. Toronto 1898. He emigrated to Canada in his forty-second year and became known as the poet of the Scottish colony at Kingston. He wrote with fluency in Gaelic and his 'Clàreach nam Beann' created much enthusiasm among his compatriots. He is also author of many English poems, such as 'My Rowan Tree'; 'The Mountain Minstrel' (1887); and 'Poems and Songs' (1888).

McConnell, mạ-kŏn'ĕl, **Samuel D.,** American Protestant Episcopal clergyman and author: b. in Westmoreland County, Pa., in 1846. He was graduated at Washington and Jefferson College in 1868, and was ordained a priest in 1873; was rector of Saint John's Church, Erie, Pa., 1872–3; held rectorships at Watertown, Conn. (1873–6) and Middletown, Conn. (1876–82); became rector of Saint Stephen's Church, Philadelphia, in 1882; of Holy Trinity Church, Brooklyn, N. Y., in 1896; and since 1902 has been rector of All Souls' Church, New York city. He has published a 'History of the American Episcopal Church' (1890); 'Sons of God' (1891); 'Sermon Stuff' (1888, 1895); 'A Year's Sermons' (1896); 'The Open Secret'; 'The Next Step in Christianity'; 'Essays, Practical and Speculative' (1900); and 'The Evolution of Immorality' (1901).

McCook, mạ-kûk'. **Alexander McDowell,** American soldier: b. Columbiana County, Ohio, 22 April 1831; d. Dayton, Ohio, 12 June 1903. He was graduated at West Point in 1853, and with the commission of second lieutenant of the 3d infantry was ordered to New Mexico. In 1861 he gained his captaincy and saw much service during the Civil War. He commanded the Ohio volunteers at Bull Run and rapidly gained promotion, being appointed major-general of volunteers in 1862. His brilliant military reputation was made at the battles of Shiloh, Murfreesboro, Chickamauga, etc., and in 1865 he was brevetted brigadier-general in the regular army. He was subsequently placed in command of the military school at Fort Leavenworth, was commissioned major-general in 1894 and retired the following year. General McCook came of a fighting family. He was the son of Daniel McCook (q.v.) who was killed by Morgan's guerillas in 1863. Seven of the general's brothers took part in the War for the Union, three of whom, like their father, were killed. Four of the eight McCook brothers attained the rank of general.

McCook, Anson George, American soldier and politician: b. Steubenville, Ohio, 10 Oct. 1835. He took part in the Civil War as captain in an Ohio regiment, and was colonel of a regiment in the Army of the Cumberland. At the end of the war he was brevetted brigadier-general. In 1873 he was elected from New York as a Republican member of Congress, and became secretary to the United States Senate from 1887 to 1889, and city chamberlain of New York from 1893 to 1897.

McCook, Daniel, American soldier: b. Canonsburg, Pa., 20 June 1798; d. near Buffington's Island, Ohio, 21 July 1863. Having received a college education, he removed from Pennsylvania to Ohio and settled at Carrollton. Although 63 years old at the outbreak of the Civil War, he entered the Union army, in which he served as major of volunteers. During one of the Morgan raids (q.v.) he received a wound from which he died shortly after. Eight sons of his served as officers in the Federal army, three of whom were killed in battle.

McCook, Henry Christopher, American clergyman and entomologist: b. New Lisbon, Ohio, 3 July 1837. He was graduated at Jefferson College (now Washington and Jefferson) in 1859, studied at the Western Theological Seminary, and in the Civil War he served as 1st lieutenant and chaplain in the 41st Illinois regiment, 1861–2. In 1862–3 he was minister of a church at Clinton, Ill.; from 1863 to 1870 labored in St. Louis as a home missionary; and subsequently became pastor of the Tabernacle Presbyterian Church in Philadelphia, a charge he still retains. He served as chaplain of the 2d regiment of Pennsylvania volunteers in the Spanish-American war, and is chaplain of the Pennsylvania Commandery of the Loyal Legion, president of the American Entomological Society, vice-president of the Academy of Natural Sciences, Philadelphia, and president of the American Presbyterian Historical Association. His writings include: ‹The Gospel in Nature›; ‹The Mound-Making Ants of the Alleghanies› (1877); ‹The Agricultural Ants of Texas› (1879); ‹Honey Ants and Occident Ants› (1882); ‹Tenants of an Old Farm› (1884); ‹The Women Friends of Jesus› (1885); ‹American Spiders and Their Spinning-Work› (1889–93); ‹The Latimers, a Scotch-Irish Historic Romance of the Western Insurrection› (1898); and ‹Martial Graves of Our Fellow Heroes in Santiago de Cuba.› See article on SPIDERS by Dr. McCook in this encyclopedia.

McCook, Neb., city, county-seat of Red Willow County; on the Republican River, and on the Burlington & Missouri River Railroad; about 230 miles west by south of Lincoln, the capital of the State. It is in a rich agricultural region. McCook owes much of its prosperity to the fact that it is the headquarters of a railroad division, and has railroad shops. The sugar beet, alfalfa, wheat, and corn are the principal productions of the surrounding farms. A number of cattle are raised and a large number of live stock from Willow County and vicinity is shipped from McCook. Pop. (1910) 3,765.

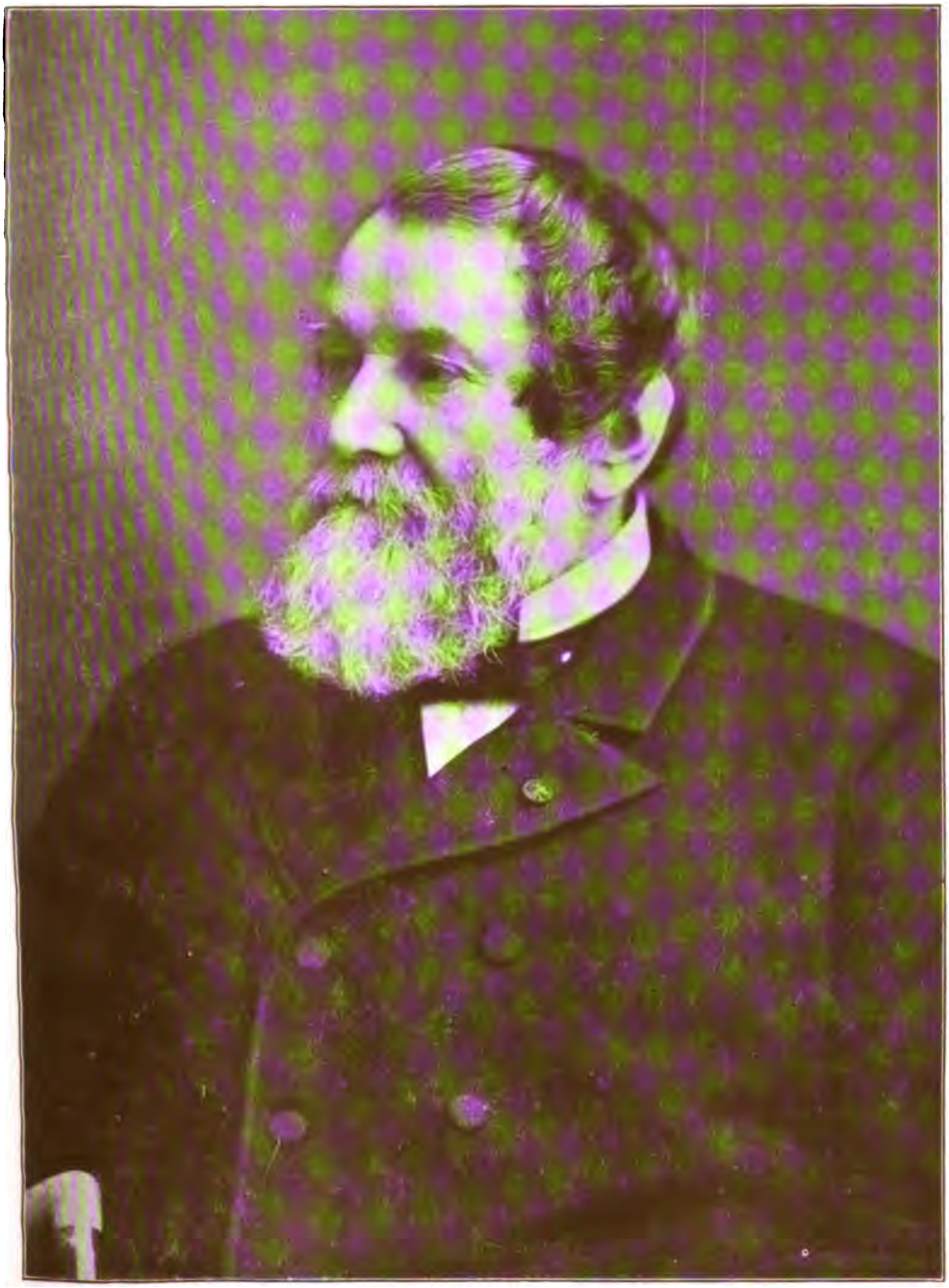
McCormick, ma-kôr'mĭk, **Alexander Hugh,** American naval officer: b. in the District of Columbia, 9 May 1842. He was acting midshipman at the United States Naval Academy in 1859; in April 1861 entered into active service, and served in blockading squadrons throughout the Civil War. He became captain in 1892. Since the Civil War he has performed various sea duties, and has served in the department of mathematics and in that of astronomy and navigation at the Naval Academy. He was inspector of ordnance, 1876–81; made a cruise around the world, 1881–5; was assigned to the ordnance department, 1885–92; to the Asiatic station, 1892–4; was captain of the Norfolk Navy-Yard, 1894–7; member of the armor and personnel board, 1897–8; and commandant of the Washington Navy-Yard in 1898. In 1899 he was raised to the rank of rear-admiral, and was retired 26 March 1900.

McCormick, Cyrus Hall, American inventor and manufacturer: b. in Virginia 1809; d. Chicago 13 May 1884. He removed from his native State to Cincinnati in 1845, and two years later went to Chicago. In 1831 he invented an improved reaping-machine, which was patented and further improved, and which brought him great wealth and world-wide fame, with many decorations, medals, etc. He contributed liberally in 1859 to the establishment of the Presbyterian Theological Seminary of the Northwest, in Chicago. He also endowed a chair in Washington and Lee University, Virginia.

McCormick, Leander James, American inventor: b. in Virginia 1819; d. Chicago, 20 Feb. 1900. In early life he worked with his father in manufacturing reaping-machines; removed to Chicago in 1848, and entered into partnership with his brother, Cyrus Hall McCormick (q.v.), and superintended the manufacturing department of their reaping-machine plant until 1879, when the firm was incorporated as the McCormick Harvesting-Machine Company. Ten years later he retired from active business. Many of the improvements in the famous McCormick reaping-machine were made by him. In 1871 he gave an observatory with a powerful telescope to the University of Virginia.

McCormick Observatory, an astronomical station connected with the University of Virginia, near Charlottesville, Va. The funds for the construction of the observatory were principally the gift of Leander J. McCormick, and it was built in 1883–4. The principal instrument is an equatorial of 26 inches aperture, a companion instrument to the Washington 26-inch, both being the work of Alvan Clark & Sons, of Cambridgeport, Mass. The position of the observatory is lat. 38° 2′ 1.2″ N.; lon. 5° 14′ 5.2″ W.

McCormick Theological Seminary, in Chicago, Ill.; opened in 1830, under the auspices of the Presbyterians, as a department of Hanover Academy, at Hanover, Ind. Ten years after its opening, the school was removed to New Albany, Ind. Cyrus H. McCormick (q.v.) offered the institution a liberal endowment, which generous gift caused the removal of the school to Chicago, in 1859. It was for a time known as the Presbyterian Theological Seminary of the Northwest. In 1886 the present name was taken in honor of its liberal benefactor. No fees are charged for lodging or tuition, and some of its income is used in assisting worthy and needy students. In 1910 there were con-



CYRUS HALL McCORMICK,

INVENTOR OF THE REAPING MACHINE

nected with the seminary 13 professors and instructors and 151 students. The library contained about 25,000 volumes. The total income on productive funds and from other sources, but excluding benefactions, was about $70,000. Its buildings and grounds were valued at nearly $1,000,000 and its endowment funds at about $1,800,000.

McCosh, ma-kŏsh', **James**, Scotch-American author and educator: b. in Ayrshire 1 April 1811; d. Princeton, N. J., 16 Nov. 1894. He was educated at the University of Glasgow, which he entered at 13, and at the University of Edinburgh, where he went in 1829. He became a minister of the Church of Scotland; was settled at Arbroath in 1835, and at Brechin in 1839; but at the disruption of the Scottish Church joined the Free Church, whose organization he was active in promoting. In 1850 he published 'The Method of the Divine Government, Physical and Moral,' in which he applied the philosophy of Sir William Hamilton to questions of theology with such skill as to elicit from him the highest commendation. This work at once gave McCosh wide fame as a philosophical thinker, and in 1851 he was appointed professor of logic and metaphysics in Queen's College, Belfast, where he remained 18 years, not only discharging his professional duties, but also entering earnestly into work of religious and social improvement, through which his spirit of benevolence and his enlightened zeal for general education accomplished lasting results. In 1868 he was elected president of the College of New Jersey (now Princeton University), having previously visited this country and become impressed with its educational promise. This promise was especially bright when he assumed the presidency of Princeton, but the conditions of transition in the sphere of higher education were such as to demand consummate powers of leadership. Such powers McCosh, although a foreigner, brought to his work with most satisfying success. During the 20 years of his administration at Princeton he saw the number of students and professors more than doubled and prosperity increased in all departments. His resignation in 1888 was due to the advance of years, and he was able to continue in the chair of philosophy beyond that period. As a philosopher he maintained the principles of the Scottish metaphysicians against all empirical methods, but went beyond his predecessors in the direction of intuitionalism, although he once declared that this «rose out of rationalism as fogs rise out of the melted ice,» and few orthodox theologians were abreast of him in welcoming the evolutionary features of the new biology. His writings on theology, philosophy, and psychology are very numerous and include 'Typical Forms and Special Ends in Creation,' in collaboration with Dickie (1856); 'The Intuitions of the Mind Inductively Investigated' (1860); 'The Supernatural in Relation to the Natural' (1862); 'An Examination of Mill's Philosophy' (1866); 'Laws of Discursive Thought' (1869); 'Christianity and Positivism' (1871); 'The Scottish Philosophy, Biographical and Critical' (1874); 'The Development of Hypothesis' (1876); 'The Emotions' (1880); 'Psychology of the Cognitive Powers' (1886); 'Psychology of the Motive Powers' (1887); 'Realistic Philosophy Defended' (1877); and 'Our Moral Nature' (1892). Consult Sloane, 'The Life of James McCosh' (1896).

McCown', **John P.**, American soldier: b. Tennessee 1820. He was graduated from West Point in 1840, and was assigned to the 4th artillery; he served in the Mexican War, and was brevetted captain for gallantry at Cerro Gordo in 1847. In 1861 he resigned from the United States army to join the Confederate service, and was made brigadier-general. He commanded at New Madrid, Mo., evacuating the town when besieged by General Pope, and later served in the Tennessee campaign.

McCrackan, ma-krăk'an, **William Denison**, American author and lecturer: b. Munich, Germany, 12 Feb. 1864. He is of American parentage, but received his earliest education at the Latin Gymnasium, Stuttgart, Germany, and was afterward graduated at Trinity College, Hartford, Conn., in 1885. He has written 'The Rise of the Swiss Republic' (1892); 'Romance and Teutonic Switzerland' (1894); 'Swiss Solutions of American Problems'; 'Little Idyls of the Big World' (1895); and 'The Huntington Letters' (1897).

McCrack'en, **Henry Mitchell**, American Presbyterian clergyman and educator: b. Oxford, Ohio, 28 Sept. 1840. He was graduated at Miami University in 1857; for four years was a teacher and school superintendent; studied at the United Presbyterian Theological Seminary, Xenia, Ohio, and at the Princeton Theological Seminary, and later at Tübingen and Berlin universities. He was minister of the Westminster Church, Columbus, Ohio, 1863–7, and of the First Presbyterian Church at Toledo, Ohio, 1869–81. In 1867 he was deputy to the General Assembly of the Free Church of Scotland, and to that of the Presbyterian Church of Ireland in 1884. From 1880 to 1884 he was chancellor of the Western University, Pittsburg, Pa., and in the latter year became vice-chancellor and professor of philosophy in the University of the City of New York, of which he was made chancellor in 1891. Since then the name of the institution has been changed to New York University, and the seat of the University College and School of Applied Science has been removed to University Heights, New York city. Under his administration the Hall of Fame for Great Americans (q.v.) was added to the university, its growth and prosperity greatly increased, and the extension of its work and influence has given it a leading position in the field of American education. He resigned the chancellorship 28 Sept. 1910. Besides numerous papers on subjects of education, religion, and philosophy, he has published 'Popular Sermons' (1875); 'Leaders of the Church Universal' (1879); 'John Calvin' (1888); 'A Metropolitan University' (1892); 'Lives of Church Leaders: or Heroes of the Cross' (1900).

McCrady, ma-krā'dĭ, **Edward**, American soldier and historian: b. Charleston, S. C., 8 April 1833; d. there 2 Nov. 1903. He was graduated at Charleston College, admitted to the bar in 1855, and joined earnestly in the movement which led to the secession of his State. He took part in the capture of Castle Pinckney 27 Dec. 1860, and was present at the bombardment of Fort Sumter in the following April. As captain of the first military company raised in

South Carolina for the whole war, he entered the Confederate army, 27 June 1861, was made major and then lieutenant-colonel, was badly wounded at the second battle of Bull Run (or Manassas), 30 Aug. 1862, and in January 1863 received an injury in camp from a falling tree, in consequence of which he was transferred from field service to the command of a camp of instruction at Madison, Fla., in 1864. He remained at that post until the end of the war. Later he became major-general of State troops and a member of the South Carolina legislature (1880–90). Among his more important writings may be mentioned: 'The History of South Carolina Under the Proprietary Government, 1670–1719' (1897); 'The History of South Carolina Under the Royal Government, 1719–1776' (1899); 'The History of South Carolina in the Revolution, 1775–1780' (1901); and 'The History of South Carolina in the Revolution, 1780–3' (1902).

McCrary, mạ-krā'rĭ, **George Washington**, American lawyer; b. Evansville, Ind., 29 Aug. 1835; d. St. Joseph, Mo., 23 June 1890. His parents removed with him in 1836 to that part of Wisconsin Territory which is now the State of Iowa. He received a public school education, studied law, was admitted to the bar in 1856 and began practice in Keokuk, where he soon became prominent. Elected to the State legislature in 1857 he became State senator in 1861–5, and member of Congress 1868–77. In Congress introduced the law under which the judiciary of the United States was reorganized; proposed appointment of joint committee to count electoral vote in Hayes-Tilden controversy; was prominent in furthering passage of Electoral bill. He served on committees on revision of laws, naval affairs, and judiciary; was secretary of war under President Hayes 1876–9 and was judge of the 8th judicial district in 1879–84. He then resigned and settled in Kansas City, Mo., where he became general consulting attorney of the Atchison, Topeka and Santa Fe Railroad Company. He was the author of 'American Law of Elections' (1875).

McCrea, mạ-krā', **Jane**, American woman: b. Bedminster (now Lamington), N. J., 1753; d. near Fort Edward, N. Y., 27 July 1777. She was the daughter of a Scotch Presbyterian clergyman at whose death she went to live with her brother near Fort Edward, N. Y. At the commencement of the Revolution she was betrothed to David Jones, an officer of the crown. When Burgoyne's army was advancing from the north she was visiting a Mrs. MacNeil at Fort Edward. Her brother, sharing the general alarm felt throughout the region, sent for his sister, intending to remove to a safer locality. On the morning fixed upon for her departure, a band of Indians in the employ of Burgoyne suddenly swooped down upon the MacNeil household and they, together with Miss McCrea, were made prisoners. Mrs. MacNeil and her party arrived in safety at Burgoyne's camp, but half an hour later another party of Indians arrived, bearing a number of freshly severed scalps, one of which bore the long glossy hair of Miss McCrea, whose body was later found by a roadside. The precise manner of her death never became known. The Indians claimed that she was killed by a random shot from an American detachment, whereupon her captors determined to secure the reward for her scalp. It has been surmised that a quarrel arose among the Indians as to whose captive she was and that one of them in a frenzy tomahawked her. Other authorities credit the story that Lieutenant Jones hired the Indians to bring his betrothed to camp where they were to be married and that she was killed in a controversy which arose as to whose captive she was. Lieutenant Jones denied this story; he lived to old age, a morose and gloomy man. At all events the tragedy caused a general feeling of horror throughout America and England. Burgoyne called a council of his Indian chiefs in order to reprove them, but as his allies would have deserted him the offender was allowed to go unpunished. A blasted pine long marked the spot where tradition relates that the beautiful young girl was murdered, and her grave may be seen in a small cemetery near the ruins of Fort Edward.

McCreary, mạ-krē'rĭ, **James Bennett**, American lawyer: b. Madison County, Ky., 8 July 1838. He was graduated at Centre College, Danville, Ky., in 1857, and from the Law School of Cumberland University, Tenn., 1859. He entered the Confederate army in 1862 as major of cavalry, and served until close of war. He was a member of the Kentucky House of Representatives in 1869, 1871, and 1873 (being Speaker 1871–3); governor of Kentucky 1875–79, and a member of Congress in 1885–97. He was a delegate to the International Monetary Conference at Brussels, Belgium, in 1891, and in 1903 became United States Senator.

McCree'ry, James, American merchant: b. Ireland; d. Aiken, S. C., 1893. He came to the United States when about 20 and engaged in the dry goods business in Baltimore, and at the beginning of the Civil War removed to New York, where he soon established a business of his own which made him ultimately one of New York's leading merchants. He was a member of many public boards, one of the founders of the silk industry in America, and director of numerous commercial enterprises. He was one of the Chamber of Commerce delegation sent to England two years before his death, and was a leading member of various clubs chiefly of an educational or public character.

McCulloch, mạ-kŭl'ŏ, **Benjamin**, American soldier: b Rutherford County, Tenn., 11 Nov. 1811, d. 7 March 1862. He became a skilled hunter and boatman, and joined other frontiersmen in settling Texas. In 1835 he served in the Texan war for independence, being in the battle of San Jacinto. He also commanded a company of rangers in the Mexican War under Taylor and Scott, did important work as a scout, and was specially distinguished at the battles of Monterey and Buena Vista, and in the siege of the City of Mexico. In 1853 he was appointed United States marshal in Texas. During the Civil War he served in the Confederate army, was appointed brigadier-general, and sent into Missouri, where he was defeated at the battle of Dug Spring, but later united his forces with those of General Price and then defeated the Federals under General Lyon (q.v.) at Wilson's Creek. He commanded a corps at the battle of Pea Ridge, Ark., where he was killed.

McCulloch, mạ-kŭl'ŏʜ, **Hugh**, American financier: b. Kennebunk, Maine, 7 Dec. 1808; d. near Washington, D. C., 24 May 1895. He was educated at Bowdoin College and went in 1833 to Fort Wayne, Ind., where he established a law practice which he continued until 1835 when he entered a branch of the State bank of Indiana. He was chosen director in 1836 and in 1857 became president of the newly incorporated State bank of Indiana. He was appointed Comptroller of the Currency in 1863 and in 1865 became Secretary of the Treasury under President Lincoln. Owing to the enormous expenses incurred by the Civil War, the finances of the country were in a critical condition; in six months the large sum due 500,000 soldiers and sailors was paid together with other heavy expenses, and a reduction of the National debt was begun. McCulloch converted more than $1,000,000,000 of short-time obligations into a funded debt, and in less than two years had succeeded in putting the finances of the country on a sound basis. Congress approved his course and his plan for a speedy resumption of specie payment, but he met with opposition in his purpose to retire the legal-tender notes. He occupied the office until 1869 and in 1871 opened a banking business in London where he remained until 1878. He was reappointed to the secretaryship of the treasury by President Arthur in 1884 and continued in office until the close of the administration. He wrote ‘Men and Measures of Half a Century,’ and many of his speeches together with a large share of his correspondence have been published. He was the last living member of Lincoln's distinguished cabinet.

McCulloch, John Ramsay, English political economist: b. Isle of Whithorn, Wigtownshire, 1 March 1789; d. London, England, 11 Nov. 1864. He was educated at Edinburgh; became editor of ‘The Scotsman,’ an Edinburgh newspaper, and from 1818 wrote many articles for the ‘Edinburgh Review.’ He was professor of political economy in London University, 1828–32, and in 1838 was appointed comptroller of the stationery office. Among his many books may be mentioned: ‘The Principles of Political Economy’ (1825); ‘Historical Sketch of the Bank of England’ (1831); ‘Dictionary of Commerce’ (1832); ‘Geographical Dictionary’ (1841); ‘A Treatise on the Principles and Practical Influence of Taxation and the Funding System’ (1845); ‘The Literature of Political Economy’ (1845); etc. He also published a new edition of the works of Adam Smith (1828) and those of Ricardo (1846), both of which were accompanied by a biographical sketch. He was one of the earliest advocates of free-trade in Great Britain.

MacCullough, mạ-kŭl'ȯk, **John Edward,** American tragedian: b. Coleraine, Ireland, 2 Nov. 1837; d. Philadelphia 8 Nov. 1885. He came to the United States in 1853, studied for the stage and made his début in Philadelphia, 1857. He played with Edwin Forrest, who left him at his death all his manuscript plays. In 1869 he managed, with Lawrence Barrett, the Bush Street Theatre in San Francisco, Cal. His appearance in England in 1881 was not successful, but his popularity in America remained unbroken. Despite his lack of literary education, a serious handicap, he won high rank in his profession. He played De Mauprat to Edwin Booth's Richelieu, and Richmond to his Richard III. His interpretation of Virginius was unexcelled during his day. Among his leading roles were Hamlet, Macduff, Richelieu, Spartacus, etc. In 1884, at the height of his brilliant career, he suddenly collapsed, both physically and mentally; he died a year later in an insane asylum in Philadelphia.

McCullough, John Griffith, American politician: b. Welsh Tract, near Newark, Del., 16 Sept. 1835. He was graduated from Delaware College in 1855 and from the law department of the University of Pennsylvania in 1858. He removed to California in 1859, engaged in law practice in Mariposa County, was elected to the State legislature in 1861, to the senate in 1862 and in 1863–7 was attorney-general. In 1867–73 he practised law in San Francisco and then removed to Bennington, Vt., since when he has been director and president of several railway systems and prominently connected with various banking and commercial enterprises. He was elected to the Vermont senate in 1898 and in 1902 was elected governor of the State.

MacCunn, mạ-kŭn', **Hamish,** Scottish composer: b. Greenock, Scotland, 22 March 1868. He was educated in Greenock and at the Royal College of Music, London, made his début in the musical world in 1887, and in 1888 became a junior professor of harmony in the Royal Academy of Music, which position he resigned in 1894. He was director of the Hampstead Conservatory Orchestra Society in 1892. As a composer he has attained high rank; his productions are rich in melody, and his command of the orchestra is remarkable. His work is typically Scottish in character and in choice of subject. Among the more important of his numerous works are overtures, etc., ‘The land of the Mountain and the Sun’; ‘Chior Mhor’; ‘The Dowie Dens o' Yarrow’; ‘The Ship o' the Fiend’; and the operas, ‘Jeannie Deans’ and ‘Diarmid.’

McCurdy, mạ-kėr'dĭ, **James Frederick,** Canadian Orientalist: b. Chatham, N. B., 18 Feb. 1847. He was educated at the University of New Brunswick, Princeton Theological Seminary, and in Germany. He was assistant professor in Oriental languages at Princeton, 1873–82; and Stone lecturer there in 1885–6. In 1886 he was appointed lecturer in University College of Toronto, and since 1888 has been professor of Oriental languages in that college. Among his works are: ‘Aryo-Semitic Speech’ (1881); ‘History, Prophecy, and the Monuments’ (3 vols. 1894–1901); ‘Life and Work of D. J. Macdonnell’ (1897); an original commentary on Haggai, and various translations for the American edition of ‘Lange's Commentary’; etc.

McCutcheon, mạ-kŭt'chȯn, **George Barr,** American novelist: b. Tippecanoe County, Ind., 26 July 1866. He was educated at Purdue University and began his career as reporter on the Lafayette *Journal* in 1889. At present (1903) he is city editor of the Lafayette *Courier*. He has published ‘Graustark’ (1900); ‘Castle Craneycrow’ (1902); ‘The Sherrods’ (1903); ‘The Purple Parasol’ (1905).

McCutcheon, John Tinney, American cartoonist: b. near South Raub, Ind., 6 May 1870. He is a brother of G. B. McCutcheon (q.v.). He was graduated from Purdue University in 1889 and has been connected with the leading newspapers of Chicago since 1889, his work as a cartoonist becoming famous in the campaign of 1896. He was special correspondent during the Spanish-American War, Chinese troubles, and Boer war. He has published in book form 'Cartoons by McCutcheon' (1903).

McDan'iel, Henry Dickerson, American lawyer: b. Monroe, Ga., 4 Sept. 1837. He was graduated from Mercer University, Macon, Ga., and admitted to the bar in 1856. He attended as delegate the Georgia Secession Convention in 1861; and served in the Confederate Army until the end of the war, attaining the rank of major in the 11th Georgia infantry. In 1865 he was a member of the Georgia Constitutional Convention. His disability to hold office having been removed in 1872 by the United States Congress, he served in the State legislature, 1873-4; was State senator, 1874-83, and in 1883 he was elected governor of Georgia, which office he occupied for three years.

McDonald, Alexander, American politician: b. Clinton County, Pa., 10 April 1832; d. Norwood Park, N. J., 13 Dec. 1903. He was educated at Lewisburg University, Pa., and removed to Kansas in 1857. At the outbreak of the Civil War he was active in raising troops for the Federal army, supporting three regiments at his own expense for a time. He was elected to Congress from Arkansas on the readmission of that State to the Union.

Macdonald, Etienne Jacques Joseph Alexandre, ā-tē-ĕn zhäk zhō-zef äl-ĕks-ändr mäk dŏ-näl, DUC DE TARENTE, French soldier: b. Saucerre, France, 17 Nov. 1765; d. Courcelles, France, 24 Sept. 1840. He served in the French Revolution as Colonel, brigadier-general, and general, and in 1798 was made governor of the Roman states, and of Naples in 1799. He was made a marshal of France for his services at Wagram 6 July 1809.

Macdonald, George, Scottish poet and novelist: b. Huntly, Aberdeenshire, 1824; d. Ashtead, Surrey, 18 Sept. 1905. He was educated at Aberdeen University and at King's College, London, and entered the Independent ministry, from which he retired and became a lay member of the English Church. Macdonald's work comprises poetry, novels, religious, and juvenile books and is marked by deep religious feeling and devotion to lofty ideals of life. His novels deal chiefly with Scottish character and scenery. The best-known of his many books are: 'David Elginbrod' (1862); 'Alec Forbes of Howglen' (1865); 'Annals of a Quiet Neighborhood' (1866); 'Robert Falconer,' his best work (1868); 'The Miracles of Our Lord' (1870); 'The Marquis of Lossie' (1877).

Macdonald, Sir Hector, British general: b. Scotland 1853; d. Paris, France, 25 March 1903. In 1870 he enlisted and served in the ranks nine years. He was with Sir F. Roberts at Cabul, and for brilliant service at Candahar was made 2d lieutenant. He served in the Boer war of 1881 and was captured at Majuba Hill. He was conspicuous for bravery at Suakim in 1888; was at the capture of Takar in 1891; and was placed in command of the forces in Egypt, 1897-8. He was in command at Magersfontein in 1899 and was then transferred to South Africa, where he commanded the Highland Brigade, 1899-1901. He was made K.C.B. and in 1902 was placed in command at Ceylon. Summoned home in 1903 on a charge of immoral conduct, he went to a hotel in Paris and committed suicide. The committee of inquiry reported (October 1903) that there was not a scintilla of evidence to substantiate the charges preferred against him and reported virtually that it was an instance of a proud, sensitive man assassinated by slander.

MacDonald, James Wilson Alexander, American sculptor: b. Steubenville, Ohio, 25 Aug. 1824; d. 14 Aug. 1908. Among his numerous works are statues of 'Joan of Arc'; 'Italia'; Edward Bates (1876) in Forest Park, St. Louis; Gen. Custer, at West Point; Fitz-Greene Halleck in Central Park, New York; an epuestrian statue of Gen. Nathaniel Lyon; numerous busts, etc.

Macdonald, Sir John Alexander, Canadian statesman: b. Glasgow, Scotland, 11 Jan. 1815; d. Ottawa, Ont., 6 June 1891. In early youth he emigrated with his father to Canada. At twenty-one he was a practising barrister at Kingston, Upper Canada, and in 1844 he was elected to the Canadian Parliament for that constituency. While repudiating the name of Tory, throughout his career Macdonald was the most conspicuous figure in the Conservative party in Canada. He became a cabinet minister in 1847, and, after various vicissitudes of his party, prime minister in 1857. Macdonald's most important work is connected with the federation of Canada. The French and the English provinces, previously independent, had been united under one parliament in 1841, and during the next twenty-five years each party had both an English and a French leader. Ministries changed rapidly, and in 1864 there was a deadlock. This made necessary some wider union; and in that year a conference of delegates met at Quebec to consider the federation of British North America. Directed largely by Macdonald's tact and resource this conference led to the establishment of the Dominion of Canada in 1867, under the British North American Act, passed by the British Parliament. Macdonald became the first prime minister of the Dominion. At first there were only four provinces but he carried through successfully the negotiations by which the Hudson Bay company ceded its interests in the northwest to Canada; he secured also the entrance of British Columbia on the condition of building rapidly a transcontinental railway. During an election in 1872 Macdonald accepted large sums for party purposes from Sir Hugh Allan, one of the chief projectors of the Pacific railway, and in 1873 owing to this «Pacific Scandal» he was forced to retire from office. In 1878 he again became prime minister with a policy of protection and he may be regarded as the father of that system in Canada. He remained prime minister until his death in 1891. The confederation of Canada, the acquisition by Canada of the Northwest, the building of the Intercolonial and the Canadian Pacific railways, and the policy of protection were all effected under Macdonald's lead. His brilliant intellect and ready wit made him a really great leader. In 1867 he was created K.C.B., in 1884 G.C.B., and on his death his widow was created Baroness Macdonald in her own right.

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McDonald, John Bartholomew, American contractor: b. Ireland 7 Nov. 1844; d. 17 March 1911. He was brought to this country in 1847, and received his education in the public schools of New York. Among his successful undertakings may be mentioned the 4th Avenue improvement for sinking the New York Central Railroad tracks in New York city from 42d Street to Harlem; West Shore Railroad from Weehawken to Buffalo; Baltimore & Ohio Railroad from Baltimore to Philadelphia; Illinois Central Railroad from Elgin, Ill., to Dolgeville, Wis.; the Georgian Bay branch of the Canadian Pacific Railroad; the Trenton «cut-off» of the Pennsylvania Railroad; the Baltimore Belt Railroad, which carried the great Baltimore & Ohio Railroad under the city of Baltimore; etc. He constructed the Jerome Park Reservoir, New York city, the largest artificial storage reservoir in the world. His greatest contract was for the construction, equipment, operation and maintenance of the Rapid Transit Railroad (the «Subway») in New York city.

Macdonald, John Sandfield, Canadian statesman: b. St. Raphael's, Canada, 12 Dec. 1812: d. Cornwall, Ont., 1 June 1872. He was self-educated and admitted to the bar in 1840, practising successfully in Cornwall. In 1841 he was elected to the Canadian Parliament as member from Cornwall and re-elected in 1843, 1848, 1852, and 1854. Macdonald was solicitor-general in 1849–51; 1852–4 was Speaker of Parliament; in 1857 was member of Parliament for Cornwall; and premier for Cornwall in 1862–4; in 1867–71 he was premier for Ontario.

McDonald, Joseph Ewing, American lawyer: b. Butler County, Ohio, 29 Aug. 1819: d. Indianapolis, Ind., 21 June 1891. He was educated at Ashbury University; studied law and was admitted to the bar and established a practice in Crawfordsville, where he was county prosecuting attorney, 1845–7. In 1848 he was member of Congress and from 1856–60 attorney-general of Indiana. He then practised law in Indianapolis and in 1864 was an unsuccessful candidate for governor. In 1872 he was chairman of the Democratic State Committee and in 1875 was elected to the United States Senate, serving until 1881, when he returned to Indianapolis where he resumed the practice of law.

Macdonell, măk-dŏn'ĕl, **Alexander,** Canadian Roman Catholic prelate: b. Inverness-shire, Scotland, 1762: d. Dumfries, Scotland, 14 Jan. 1840. He was educated at the Scots College, Spain, entered the priesthood in 1787, and was for several years a missionary. He assisted in the organization of the Glengarry Fencibles and was their chaplain, and in 1803 established for its disbanded members a colony in Glengarry County, Ontario, Canada. He also assisted in raising the Canadian regiment of Glengarry Fencibles, which was actively engaged in repeling the American invaders in the War of 1812–4. In 1820 he was made Apostolic Vicar of Upper Canada, and through his influence 48 parishes were established in Canada. He was the first Roman Catholic bishop in Upper Canada and died in Scotland while on a mission to obtain funds for the founding of a seminary in his see.

McDonnell, Charles Edward, American Roman Catholic prelate: b. New York, N. Y., 1 Feb. 1854. He studied at the De La Salle Institute and Saint Francis Xavier's College in that city, but finished his theological course at the American College, Rome, Italy. While there he received the degree of D.D., and was ordained priest by Bishop Chatard 18 May 1878. Returning to America the same year, he was appointed assistant at St. Mary's Church, New York city, and in 1879 was transferred to Saint Patrick's Cathedral. On the death of Bishop Loughlin, Dr. McDonnell, who, at the time was Archbishop Corrigan's secretary, was named bishop of Brooklyn, being consecrated by Archbishop Corrigan 25 April 1892. At his invitation the Benedictine Fathers have come from the Bahama Islands to establish themselves in his diocese, and the Redemptorists also have made a foundation in Brooklyn. He is spiritual adviser of the Catholic Benevolent Legion, and also honorary president of the International Catholic Truth Society. The diocese has a Catholic population of approximately 500,000; 290 diocesan priests; 154 churches; 68 parochial schools; 1 diocesan seminary; 12 orphan asylums and 6 hospitals, besides academies, colleges, and charitable institutions.

McDonogh, măk-dŏn'ō, **John,** American philanthropist: b. Baltimore, Md., 29 Sept. 1779; d. McDonogh, La., 26 Oct. 1850. He was educated at an academy in Baltimore and entered the mercantile business there, removing in 1800 to New Orleans, where he rapidly acquired great wealth. He was deeply interested in the problem of slavery and devised a system through which his slaves were enabled to earn their freedom; he educated those among them who desired it, and sent to Africa shiploads of those who had earned their freedom. He was president of the American Colonization Society and was a generous contributor to its support. The bulk of his fortune of more than $2,000,000 he bequeathed to the cities of New Orleans and Baltimore for the establishment of free schools. The will was adjudged valid after years of litigation and Baltimore established the McDonogh schools while New Orleans invested its portion of the bequest in its public schools.

Macdonough, măk-dŏn'ō, **Thomas,** American naval officer: b. Newcastle County, Del., 23 Dec. 1783; d. at sea 18 Nov. 1825. He entered the navy as midshipman in 1800 and in 1803 was attached to the frigate Philadelphia, one of the squadron employed against Tripoli. On 26 Aug. 1803 the Philadelphia captured off the coast of Spain the Moorish frigate Mesboa and Macdonough, being left at Gibraltar with the prize, escaped the subsequent capture which befell the officers and crew of the Philadelphia. In 1804 he participated in the various attacks made upon Tripoli and under Decatur assisted in the capture and destruction of the Philadelphia, 16 Feb. 1804. In 1814 he had command of the squadron on Lake Champlain which gained an important victory over the British squadron commanded by Commodore George Dowie. For his valuable services on this occasion he was promoted to the rank of captain, then the highest in the United States navy, and received from Congress a gold medal.

Macdougal, mak-doo'gal, **Daniel Trembly,** American botanist: b. Liberty, Ind., 16 March 1865. He was graduated at De Pauw University in 1890 and studied in Germany. In 1891–2 he was engaged in explorations in Arizona and Idaho for the United States government, and in 1893–9 was instructor in plant physiology at the University of Minnesota. He was appointed director of the laboratories of the New York Botanical Gardens in 1899. Among his books are: 'Nature and Work of Plants' (1900); 'Practical Text-book of Plant Physiology' (1902); etc.

McDougall, Alexander, American soldier: b. Island of Islay, Scotland, 1731; d. New York 8 June 1786. He emigrated with his father to America in 1755 and later became a merchant in New York. He devoted himself to the cause of the colonies and was imprisoned for a time. At the outbreak of the Revolution he enlisted in the American army, serving as colonel, brigadier-general, and in 1777 was promoted major-general. He commanded at White Plains and also attained distinction in the action at Germantown. He was elected member of the Continental Congress in 1781 and was for a time minister of marine. Re-elected in 1784–5 he served for a time and then resigned, preferring active service in the field. He was a member of the New York State senate at his death.

McDougall, Walter Hugh, American artist: b. Newark, N. J., 10 Feb. 1858. He attended a military academy, and from the age of 16 was self-educated, beginning his artistic work in 1876. He entered upon a distinct career in 1884 by the introduction of newspaper illustration and cartooning in the daily press. His writings include 'The Hidden City' (1886); 'Number 11' (1890); 'History of Christopher Columbus' (1892); 'The Rambilicus and His Friends'; and 'A Marvellous Journey' (in the New York *World,* 1889).

MacDougall, William, Canadian journalist and statesman: b. Toronto 1822; d. Ottawa, 29 May 1905. He studied at Victoria College, Cobourg; was admitted to the bar in 1847; in 1848 established the 'Canada Farmer'; in 1850 founded the 'North American,' afterward united with the Toronto *Daily Globe,* for which he wrote until 1870. He was a member of the Executive Council, 1862–4, serving also as commissioner of the crown lands; provincial secretary, 1864–9; and acting minister of marine in 1866–7. In 1867 he became minister of public works, and was made lieutenant-governor of Rupert's Land, Northwest Territories, in 1869. In 1865–6, as chairman of a commission, he did efficient work for the extension of Canadian trade, and in 1873 represented Canada as special fisheries commissioner in London. He published 'Six Letters on the Amendment of the Provincial Constitution' (1872).

MacDowell, Edward Alexander, American composer: b. New York city 19 Dec. 1861; d. there 23 Jan. 1908. He was educated at the Paris Conservatory and in Germany, and in 1881 was head of the Darmstadt Conservatory, his specialty being the pianoforte and composition. He resigned his position in 1884 and in 1896 was appointed professor of music at Columbia University. In 1896–8 he was director of the Mendelssohn Glee Club of New York and in 1897–8 president of the American Society of Musicians. His work as a composer was justly famous. His compositions are marked for their delicate charm, their beauty of expression and poetry of movement, and include concertos, sonatas, symphonies, songs, and pianoforte pieces, among which are: 'Woodland Sketches'; 'Forest Idylls'; 'Lancelot and Elaine'; etc.

McDowell, Irvin, American soldier: b. near Columbus, Ohio, 15 Oct. 1818; d. San Francisco, Cal., 5 May 1885. He studied in France and was graduated from West Point in 1838. During the Canadian troubles he was stationed on the Niagara and on the Maine frontiers, and in 1841 served at West Point as assistant instructor in tactics, becoming adjutant in 1845. In 1845 he went to Mexico as aide-de-camp to Gen. Wood and for gallant conduct at Buena Vista in 1847 was promoted brevet captain, shortly afterward attaining the rank of assistant adjutant-general. Subsequently he was stationed at the War Department in Washington and in 1856 was raised to the rank of brevet-major. He was on Gen. Wood's staff at the outbreak of the Civil War and assisted in inspecting and organizing the volunteer troops at Washington. In May 1861 he was made brigadier-general of the volunteers and given command of the Army of the Potomac. Constrained by the impatience of the North, McDowell moved in July to meet the enemy and despite his carefully laid plan met a disastrous defeat at Bull Run, 21 July 1861, owing to the imperfect organization of his raw recruits. Shortly after McClellan was given command of the army and McDowell was retained at the head of one of its divisions. In 1862 he was promoted major-general of volunteers and placed in command of the First corps, which became the Army of the Rappahannock, stationed to guard Washington. In August 1862 he received command of the Third corps of the Army of Virginia and fought under Gen. Pope at the battles of Cedar Mountain, Rappahannock Station, and the second battle of Bull Run, where he performed especially good service. He was removed from the field in September 1862. Considering this action of the War Department a direct reflection upon his military services, he asked for an investigation, the result of which was favorable to him. In July 1864 he was placed in command of the Department of the Pacific Coast, and in March 1865 was made brevet major-general in recognition of his gallant services at Cedar Mountain. In 1872 he succeeded Gen. Meade as major-general in the regular army. The last years of his life were spent in California.

McDowell, James, American politician: b. in Rockbridge County, Va., 1796; d. 1851. He was graduated at Princeton in 1817; in 1831 was elected to the Virginia legislature; was governor of that State, 1842–4, and from 1847 to 1851 represented it in Congress. He favored the gradual abolition of slavery, although advocating the claims of State rights. As orator and debater in Congress he bore a prominent part in the proceedings of that body.

McDowell, Battle of. When Gen. Banks marched up the Shenandoah Valley from Winchester to Strasburg and Harrisonburg in April 1862, Gen. Jackson fell back and took position at Swift Run Gap in the Blue Ridge, on the 19th. Banks occupied Harrisonburg on the 26th where he was stopped by President Lincoln's order, and 1 May was ordered back to Strasburg. Jackson thought Banks' intention when at Harrisonburg was to advance on Staunton, 25 miles distant, and watched an opportunity to strike him in flank, when he should make the movement; but Banks did not give him the opportunity, and meanwhile Staunton was threatened from another direction. Edward Johnson's command of about 3,000 men, with three batteries, which had held Monterey 50 miles from Staunton, on the road to West Virginia, was being driven back by the brigades of Milroy and Schenck, Milroy arriving at McDowell, 12 miles east of Monterey, 1 May, where he awaited a junction with Schenck, who had been ordered to march from Romney and Moorefield, thence to join Milroy by way of Franklin. Edward Johnson pressed by Milroy in front and threatened by Banks in rear, had fallen back to West View, seven miles from Staunton, 20 April. On the afternoon of the 30th Jackson, leaving Ewell's division at Swift Run Gap to watch Banks, marched with 8,000 men and a good supply of artillery to Mechum's River Station of the Virginia Central Railroad, from which point the troops were taken by train to Staunton, his artillery and trains taking the road through Rockfish Gap. By the evening of 5 May all his troops had arrived, and on the afternoon of the 6th Edward Johnson advanced through Buffalo Gap, pushed back Milroy's advance parties on the 7th, and on the morning of the 8th reached Sitlington's Hill, where, two miles distant in the valley beyond he saw Milroy drawn up to receive him. Schenck, by a forced march from Franklin, joined Milroy at 10 A.M., with about 1,500 men. He was not impressed with the advantages of the position for an engagement, but as Milroy had prepared for it he let him fight the battle, which was opened by the artillery against the hill where Johnson was forming his command. A desultory artillery fire and skirmishing was kept up until late in the afternoon, when Milroy advanced and made a determined effort to drive Johnson from position. Jackson had now come up, and in quick succession he sent in his regiments to Johnson's assistance. The fighting was close and sanguinary, Milroy's men gaining partial advantages and reaching at points the crest of the hill; but Jackson's position was too good and his numbers too great to be overcome, and as it was growing dark, Milroy withdrew to McDowell. The Union forces engaged numbered about 2,500 men; their loss was 28 killed and 225 wounded. The Confederates had about 6,000 engaged and lost 75 killed, and 424 wounded. Schenck buried his dead, on the morning of the 9th withdrew from McDowell, and by easy marches reached Franklin on the 11th. Jackson remained at McDowell on the 9th and marching on the 10th, overtook Schenck at Franklin on the 12th, where he was found so strongly posted that he deemed attack inadvisable, and that afternoon set out on his return march to McDowell, thence to Mount Solon in the Shenandoah Valley, where he prepared for the campaign that began with the defeat of one of Banks' detachments in an engagement at Front Royal (q.v.), 23 May, his expulsion from Strasburg on the 24th and ended with his defeat at Winchester (q.v.), 25 May 1862, and his retreat across the Potomac. Consult: 'Official Records,' Vol. XII.; Allan, 'Jackson's Valley Campaign'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. II.

E. A. Carman.

Macduff, măk-dŭf', Scottish thane, or Earl of Fife, commemorated in Shakespeare's play 'Macbeth'; d. Lumphanan, Aberdeenshire, in 1057. He was the principal agent in the overthrow of the usurper Macbeth, and the restoration of Malcolm Canmore to the throne of Scotland. For this he was granted many privileges, among them that of a place of refuge to which he and his descendants could flee in case of committing unpremeditated murder. This sanctuary, in the form of a cross, stood till 1559 in the pass leading to Strathearn. It was then demolished by the Reformers, but its pedestal yet remains.

McDuffie, măk-dŭf'ĭ, **George,** American statesman and orator: b. in Columbia (now Warren) County, Ga., 1778; d. in Sumter District, S. C., 11 March 1851. He was graduated at South Carolina College in 1813, admitted to the bar in 1814, and in 1818 elected to the South Carolina legislature. From 1821 to 1834 he was a member of Congress, and from 1834 to 1836 governor of South Carolina. In 1843 he took his seat in the United States Senate, resigning on account of impaired health in 1846. In his political views and in his congressional career, he was a close follower of J. C. Calhoun (q.v.), being at the outset a liberal constructionist in constitutional questions, but afterward becoming a strong opponent of the tariff and other economic policies of the government, and also a bold advocate of nullification. Although a supporter of Andrew Jackson (q.v.) in 1828, he became bitterly antagonistic to him, not only in respect to the tariff and State rights, but especially so on the question of the United States Bank, which, as chairman of the committee on ways and means, he strongly defended against the hostile policy of the President. In 1832, as a member of the South Carolina Nullification Convention, he drafted the address of South Carolina to the people of the United States. He was one of the ablest orators of his day, and his prominence in public affairs was maintained in spite of an early wound received in a duel, from which he suffered for the remainder of his life.

Mace, Frances Parker Laughton, American poet: b. Orono, Maine, 15 Jan. 1836; d. Los Gatos, Cal., 20 July 1899. She was graduated from the Bangor High School, Maine, in 1852 and in 1855 was married to B. H. Mace, a Bangor lawyer. After 1885 she resided in California. She published 'Legends, Lyrics, and Sonnets' (1883); 'Under Pine and Palm,' poems (1887); 'Only Waiting,' her best known poem, attained great popularity.

Macé, Jean, zhŏṅ mä-sā, French educator and writer: b. Paris, France, 22 April 1815; d. there 13 Dec. 1894. He was educated at the Collège Stanislas, served in the French army, 1842–45, was editor of 'La République' in 1848, and subsequently taught school in Alsace for 10 years. In 1866 he founded a league of instruction in the Belgian manner. He was decorated with the Legion of Honor in 1880, and elected senator in 1883. He was the author of many popular books for young people, the aim of which was mainly educational, among them his best known work, 'Contes de Petit-Chateau' (1862), called in the English translation 'Home Fairy Tales'; 'History of a Mouthful of Bread' (1861); 'Servants of the Stomach' (1866); 'France Before the Franks' (1881).

Mace, an aromatic spice made from the arillode or false aril which covers the seed of a nutmeg (*Myristica fragrans*). The yellow external covering of the nutmeg (q.v.) being removed, the red, rather fleshy, arillode which partially conceals the nutmeg is encountered. After drying in the sun for several days this becomes more or less translucent and usually orange yellow and waxy. In this form it is largely exported from the Spice Islands, where it is native, and from the West Indies, where it has been introduced into cultivation. The powerful but agreeable nutmeg-like odor and flavor characteristic of it are due to a volatile oil which is obtained by distillation for use in perfumery and culinary articles. A buttery fixed oil obtained by expression is used after the admixture of the volatile oil under the names nutmeg balsam and nutmeg butter. White mace is obtained from *M. otoba* and red mace from *M. tingens;* also a low grade from *M. fatua,* but this is rarely found in the market. Mace is also largely used whole or ground in cookery.

Mace, a weapon of war formerly in use in Europe, chiefly among the cavalry, as late as the 16th century, and still used among savage tribes. It consists merely of a staff about five feet long, with a knob at the end made of iron or some other heavy substance. The knob was sometimes covered with spikes. In England the mace is used as an emblem of the officers of state, before whom it is carried. It is made of the precious metals, or of copper, gilt, and ornamented with a crown, globe, and cross.

Macedo, Joaquim Manuel de, hō-ä-kēn′ mā′noo-el dā mä-sā′dō, Brazilian poet, novelist, and statesman: b. province of Sao João d'Itaborahi 24 June 1820; d. Rio de Janeiro 11 April 1882. He studied medicine, but presently began to write and became professor of national history in the College of Rio Janeiro. He was one of the most prominent of Brazilian authors in the 19th century, and being keenly interested in politics was elected to the Brazilian Chamber in 1854. His works include: 'Moreninha,' a novel (1844; 5th ed., revised, 1877); 'O Moço Loura,' a novel of the early stages of the Portuguese conquest (1845); 'O Dous Amores' (1848); 'Vicentina' (1853); 'A Nebulosa,' a poem (1857), his greatest work, consisting of six cantos in unrhymed hendecasyllables; 'Cotie,' a drama; 'Fantasma Branco,' a comedy (1856); 'Corógraphia do Brasil' (1873); etc.

Macedonia, măs-ẹ-dō′nĭ-ạ, Turkey, an ancient monarchical territory now comprised in the Turkish vilayets or provinces of Monastir and Salonika, and inhabited by a turbulent, heterogeneous population of Turks, Greeks, Bulgarians, Servians, Wallachians, Albanians, and Jews. Its earliest name was Emathia, which remained the name of the district between the Haliacmon and the Axius, two rivers falling into the Thermaic Gulf, now the Gulf of Saloniki. This district was the earliest seat of the Macedonian monarchy. There was also an older form of the name Macedonia, namely Macetia, whence the Macedonians were sometimes called Macetæ, even after the name Macetia had come to be disused. In the time of Herodotus the name Macedonia was applied only to the district situated south and west of the Lydias, another river which falls into the Thermaic Gulf, and which flows between the two already mentioned. Philip of Macedonia extended his kingdom as far as the Lake of Lychnitis, in Illyria, in the west, Mount Scardus and Mount Orbelus in the north (so as to include the whole of Pæonia), and the River Nestus on the northeast. He added also the peninsula of Chalcidice. The part which he conquered from Thrace, lying between the Strymon and Nestus, was called *Macedonia adjecta.* The provinces of Macedonia were, in general, known by name before the time of Herodotus. In the time of Philip there were 19. Macedonia was inhabited by two different races — the Thracians, to whom belonged the Pæonians and Pelagonians, and the Illyrians. The language of the southern Macedonians shows that there must have been a large admixture of Dorian settlers among them. Pliny speaks of 150 different tribes who dwelt here at an early period. They were divided into several small states, which were incessantly at war with the Thracians and Illyrians, till Philip and Alexander gave the ascendency to one, and made it the most powerful in the world. The first of these princes, who came to the throne in 359 B.C., taking advantage of the strength of the country and the warlike disposition of its inhabitants, reduced Greece, which was distracted by internecine broils, in the battle of Chæronea, 338 B.C. His son, Alexander, subdued Asia, and by an uninterrupted series of victories for 10 successive years made Macedonia in a short time the mistress of half the world. After his death this immense empire was divided. Macedonia received anew its ancient limits, and after several battles lost its dominion over Greece. The alliance of Philip V. with Carthage during the second Punic war gave occasion to this catastrophe. The Romans delayed their revenge for a season; but when Hannibal was conquered they sent over T. Quintius Flamininis, who defeated Philip at the battle of Cynoscephalæ (197 B.C.), and compelled Philip to sue for peace, which was only granted upon his agreeing to acknowledge the independence of Greece, to surrender his vessels, to reduce his army to 500 men, and defray the expenses of the war. Perseus, the successor of Philip, having taken up arms against Rome, was totally defeated at Pydna by Paulus Æmilius, 168 B.C., and the Romans took possession of the country. Indignant at their acts of oppression, the Macedonian nobility and the whole nation rebelled under Andriscus. But after a long struggle they were overcome by Quintus Cæcilius Macedonicus; the nobility were exiled, and the country became a Roman province, 148 B.C. As such it is mentioned in the New Testament, and St. Paul's letters to the Thessalonians and Philippians are addressed to Macedonian Christians. In 395 A.D., after the dissolution of the Roman Empire, Macedonia became part of the Byzantine Empire. It came under Turkish domination in the 15th century. While the name has no modern territorial significance, it has come into considerable political prominence in connection with the conflict of nationalities in European Turkey, among whom the only object in common is a desire to throw off Turkish rule, the Bulgarians there desiring to be governed from Sofia, the Servians from

Belgrade, the Greeks from Athens, and the Turks by the Young Turk Party when it shall be established in Constantinople.

In addition to this question of nationality is one of religion, which complicates matters considerably. There are seven chief religious sects in Macedonia, the adherents of the original Greek Church, those of the schismatic Bulgarian Church, those of the New Greek Church, who recognize the Patriarch in Constantinople, those Bulgarians and Servians, converts of American missionaries, who call themselves Protestants; the Wallacks, who are an offshoot of the ancient Greek Church; those who practise the Jewish faith, and the Mohammedans.

The Turkish government, in administering the affairs of Macedonia, adopted the principle of assisting and protecting the weak and of snubbing and persecuting the strong or predominating party; thus, in a certain district where the Greek is strongest he is least popular with the Turkish authorities. Near the Bulgarian frontier, where the Bulgarian element is practically held in subjection, several public offices are held by Greeks, and so on.

This mode of government led in 1895 to a Bulgarian uprising and in 1896 to a Greek revolt, but would probably long since have proved its success from a Turkish point of view were it not for the fact that the Macedonian Committee in Sofia, a society formed for the purpose of conducting a nationalist campaign in Macedonia to effect freedom from Turkish rule, discovered its real nature and set about to disrupt it. The result was the insurrection in 1903 headed by Boris Sarafoff, the avowed aim of which was to provoke the Turks to massacre Christians and to commit acts that would arouse Christendom and compel the Great Powers to expel them from Europe. The insurrection was crushed by the Porte, with a comparative absence of the atrocities and cruelties that formerly characterized Turkish warfare. Autonomous institutions had been provided for Macedonian Christians by the Berlin Congress of 1878, and Austria and Russia, acting with the authority of Europe, now drew up a drastic reform scheme which provided that civilian agents of the two governments must accompany the Turkish inspector-general, to direct his attention to the needs of the population, and to report to their governments what is done and what left undone. The reorganization of the police in the disturbed vilayets is to be put under the charge of a foreign officer. Mixed commissions of Mohammedans and Christians are to report on crimes and outrages. The sultan is to be «requested» to allot funds for the repatriation of exiles, for the immediate needs of the populations, and for the rebuilding of their homes. Taxation of the expelled Christians is to be remitted for a year, while the formation of bands of Bashi-Bazouks is to be absolutely prevented.

Macedonians, followers of Macedonius, author of the Macedonian heresy. The Macedonians came into existence toward the decline of the Arian controversy, when Macedonius became Patriarch of Constantinople (341), and taught that the Holy Ghost was «subordinate to the Father and to the Son, unlike to them in substance, and a creature.» He was a semi-Arian, was deposed by the Arians in 360; and his special tenets condemned at the Council of Constantinople in 381. In that council the clauses defining the nature of the Holy Ghost were added to the Nicene Creed.

Maceio, mä-sä-yō', Brazil, formerly MACAYO, city and capital of the state of Alagoas, on the Atlantic coast, 135 miles from Pernambuco. The city has a cathedral, lyceum, government, and other buildings. It has manufactures of machinery and cotton goods, and considerable ship-building is carried on here. Pop. 12,000.

McEntee, măk'ĕn-tē, **Jervis**, American landscape painter: b. Rondout, N. Y., 14 July 1828; d. there 1891. He studied with F. E. Church (q.v.), and opened a studio in New York in 1858. His reputation was soon established, and he attained high rank among American artists. He became a member of the American Academy of Design in 1861. As a painter of mountain scenery and of autumn and winter landscapes he especially excelled, although in figure painting he also achieved some notable successes. Among his principal works are: 'Indian Summer' (1861); 'October Snow' (1870); 'Cape Ann' (1874); 'Winter in the Mountains' (1878); 'The Kaatskills in Winter' (1884); and 'Shadows of Autumn' (1886).

Maceo, mä-sä'ō, **Antonio**, Cuban patriot: b. Santiago de Cuba 14 July 1848; d. near Mariel 2 Dec. 1896. He joined the insurgent army as a private in 1868 and though without martial training his natural military ability and personal magnetism as a leader soon brought him to the front, making him second only to Gomez. Under his skilful leadership Martinez Campos was defeated at Demajugua and at La Galleta; his campaign in Baracoa in 1878 evidenced masterly generalship, as did also his utter rout of Santacledes at San Ulpiano. Maceo alone of all the Cuban generals refused to sign the peace of Zanjon and made for two months a brave effort to reanimate the exhausted revolutionary spirit. Finding his copatriots thoroughly discouraged, he abandoned the struggle and still refusing to sign the peace, made a tour of the United States and other countries in America seeking support for the cause of Cuban independence. He was the first of the Cuban leaders to land in 1895, and in the revolution which followed took a prominent part. His achievements in the campaign in Pinar del Rio Province, and his battles at Paralijo, Jobito, Mal Tiempo, and Candelaria are among the most brilliant feats in the history of Cuba's long struggle for independence. While crossing the trocha between Majana and Mariel, attended only by his staff, he was surrounded by a Spanish force and killed.

Maceo, José, hō-sä', Cuban patriot: b. Santiago de Cuba 1846; d. La Lama del Gata, Cuba, 5 July 1896. He was a brother of Antonio Maceo (q.v.) and took a conspicuous part in the rebellion of 1868–78. He remained in Santiago de Cuba after the peace of Zanjon, which he with his brother refused to sign. He was prominently connected with the uprising of 1879 in which he was captured and sent to Spain. An attempted escape to Gibraltar resulted in his deportation to the fortress La Mola at Mahon, in the Balearic Isles, whence he succeeded in making his escape to Algiers. He lived in Costa Rica from 1885 until the outbreak of the rebellion in Cuba in 1895, when he at once joined the insurrectionary army. He raised a large force which he commanded with signal success at Jobito and later was victorious over Canellas at Sao del Indio. He was killed in a furious engagement at La Lama del Gata in which the Cubans were finally victorious.

Macerata, mā-chā-rä'tä, Central Italy, (1) an episcopal city, capital of the province of the same name, picturesquely situated on an eminence 1,207 feet high, between the Apennines and the sea, 21 miles south of Ancona. It is encircled by walls, pierced by six gates, has a cathedral, provincial palace, and theatre on the central public square, a college founded in 1290, museum, etc. Pop. of commune about 23,000. (2) The province has an area of 1,087 square miles.

MacFad'den, Bernarr Adolphus, American editor and athlete: b. near Mill Springs, Mo., 16 Aug. 1868. He is editor and proprietor of ‹Physical Culture,› and of ‹Macfadden's Physical Development,› and ‹Beauty and Health› (monthly magazines), etc. From 1890 to 1893 he was an athlete of some prominence in the wrestling arena, and he has invented various devices for physical exercise. Among his many publications are: ‹The Athlete's Conquest›; ‹The Strenuous Lover› (a physical-culture novel); ‹Macfadden's Physical Training›; ‹The Virile Powers of Superb Manhood›; ‹Strength From Eating›; ‹Fasting, Hydropathy, and Exercise›; ‹Strong Eyes›; ‹Physical Culture Cook-Book›; ‹Power and Beauty — Superb Womanhood›; etc.

MacFar'ren, Sir **George Alexander,** English composer: b. London, England, 2 March 1813; d. there 31 Oct. 1887. He was educated at the Royal Academy of Music, where in 1837 he became a professor of symphony and harmony, and in 1875 principal. In the same year he was elected professor of music in Cambridge University. Among his compositions are the operas ‹The Devil's Opera› (1838); ‹Robin Hood› (1860); and the oratorios ‹St. John the Baptist› (1860); ‹King David› (1883); etc. He also wrote several valuable treatises: ‹Harmony› (1860); ‹Counterpoint› (1869); etc. He was knighted in 1883. After 1860 he was blind and his wife wrote his compositions from his dictation.

McFaul, James Augustine, American Roman Catholic prelate: b. Larne, County Antrim, Ireland, 6 June 1850. At an early age he attended St. Vincent's College, Beatty, Pa., finishing his classical studies at St. Francis Xavier's College, New York city, and subsequently pursuing his theological course at Seton Hall. South Orange, N. J. He was ordained priest 26 May 1877, Jersey City, Newark and New Brunswick, N. J., being each in turn the scene of his first labors in the ministry. In 1878 he was named assistant at St. Mary's Church, Trenton, N. J., and afterwards pastor of the Church of Our Lady Star of the Sea, Long Branch, N. J., some years later assumed the rectorship of the Cathedral at Trenton and then became chancellor and vicar general of the diocese. On the death of Bishop O'Farrell in 1894 Father McFaul was chosen his successor, being consecrated at Trenton 18 October of that year. Noteworthy among his achievements are the erection of an orphan asylum at Hopewell and of a home for the aged at Laurenceville, N. J. He is the author of some excellent articles on «American Citizenship» and was a leading power in forming the Young Men's Diocesan Union. However, he is perhaps best known as the founder of the Federation of Catholic Societies. The diocese of Trenton has a Catholic population of approximately 95,000; 142 priests; 100 churches with resident priests; 40 missions with churches; 29 parochial schools; 2 orphanages; 1 hospital and other charitable and educational institutions.

McFingal, măk fĭng'gal, a political satire in verse by John Trumbull, 1774–82. The poem aims to give in Hudibrastic verse a general account of the Revolutionary War, and a humorous description of the manners and customs of the times, satirizing the follies and extravagances of the author's own Whig Party as well as those of the British and Loyalists. McFingal is a Scotchman who represents the Tories; Honorius being the representative and champion of the patriotic Whigs. The first canto was published in 1774, and the poem finally appeared complete in four cantos in 1782. The work is now comparatively unknown, but its popularity at the time of its issue was very great; and more than 30 pirated editions in pamphlet and other forms were printed. It contains many couplets famous at the time, some of which are still quoted. Two that are perhaps the most famous, and are often attributed to Samuel Butler, the author of ‹Hudibras,› are —

> "No man e'er felt the halter draw
> With good opinion of the law;"

and

> "But optics sharp it needs, I ween,
> To see what is not to be seen."

McFlimsey, măk flĭm'zĭ, **Flora,** the heroine of the once famous poem ‹Nothing to Wear,› by William Allen Butler (q.v.). It was published in 1857 and became immediately popular.

McGaf'fey, Ernest, American poet and critic: b. in Ohio, August 1861. For several years he was a contributor in prose and verse to Chicago newspapers, and afterward became critic on the Saturday literary edition of the Chicago *American,* then private secretary to Carter H. Harrison, mayor of Chicago. He has published ‹Poems of Gun and Rod› (1892); ‹Poems› (1895); ‹Poems of the Town› (1900); and ‹Sonnets to a Wife› (1901).

MacGahan, Januarius Aloysius, American journalist and war correspondent: b. near New Lexington, Ohio, 12 June 1844; d. Constantinople 9 June 1878. He followed different callings in Western States, then went to Europe and studied law in Brussels. Upon the outbreak of the Franco-German war in 1870 he went to the field as correspondent of the New York *Herald,* and thenceforth devoted himself to journalism. In 1873, after heroic exertions, with extreme hardships, he reached the Russian army before Khiva and sent to the *Herald* reports of the campaign which won for him high admiration both here and in Europe, his account of the capitulation of the city being regarded as «a masterpiece of military journalism.» Returning to America, he went to Cuba to report on the Virginius affair, then to Spain, upon the Carlist uprising, where he spent 10 months with the army of Don Carlos, was captured by the Republicans, mistaken for a Carlist, condemned to death, and saved by the intervention of the United States minister. He then went to England, and in 1875 accompanied the Arctic expedition on the Pandora. In 1876 he joined the Turkish army, in the service of the London *Daily News,* and did memorable work in his description of the Bulgarian atrocities, his accounts standing approved before the world in face of all attempts to discredit them. In behalf of Bulgaria he appealed to Russia, was at the front in the Russo-Turkish war that followed, and was hailed as a chief instrument of Bulgaria's resulting independence. While nursing a friend he contracted a fever which in a few days caused his death. In 1884 the Ohio legislature secured the removal of his body from its foreign grave to its final resting-place at New Lexington. He wrote 'Campaigning on the Oxus, and the Fall of Khiva' (1874); 'Under the Northern Lights' (1876); and 'Turkish Atrocities in Bulgaria' (1876).

McGar'vey, John William, American educator: b. Hopkinsville, Ky., 1 March 1829. He was graduated at Bethany College, West Virginia, in 1850; for 12 years preached at Fayette and Dover, Mo., and in 1863 at Lexington, Ky.; and since 1865 has been professor of sacred history at the College of the Bible, Lexington. Of this college, a department of Kentucky University, he has been president since 1895. He is a clergyman of the Christian (Disciples) Church, and for 40 years has been connected with religious journalism. He has written: 'Commentaries on the Acts of the Apostles' (1863–93); 'Commentaries on Matthew and Mark' (1875); 'Lands of the Bible' (1881); 'Text and Canon of the New Testament' (1886); 'Credibility and Inspiration of the New Testament' (1891); 'McGarvey's Sermons' (1894); 'Jesus and Jonah' (1897); and 'The Authorship of Deuteronomy' (1902).

McGee, mạ-gē', **Anita Newcomb,** American physician: b. Washington, D. C., 1864. She is a daughter of Simon Newcomb (q.v.); was educated at Newnham College, Cambridge, England, at the University of Geneva, and at other institutions in Europe; also graduated in medicine at Columbian University, 1892, and took a post-graduate course in gynecology at the Johns Hopkins Hospital. From 1892 to 1896 she practised in Washington. In 1888 she married W. J McGee (q.v.). She has held prominent positions in the National Society of the Daughters of the American Revolution, and from April to September 1898 was director of its Hospital Corps, which selected women nurses for army and navy. In August 1898 to December 1899 she was acting assistant surgeon in the United States army, being the first woman to hold such a position, and was assigned to duty in the surgeon-general's office, where she organized the army nurse corps. In 1904, acting as president Society Spanish-American War Nurses and as representative of Philadelphia Red Cross Society, and by agreement with Japanese Government, took a party of trained nurses formerly in U. S. army to serve in the Japanese army for six months gratuitously. Was appointed by Minister of War as supervisor of nurses, which placed her in the same rank with officers of the Japanese army, and inspected and reported on relative nursing conditions.

McGee, Thomas D'Arcy, Canadian journalist and politician: b. Carlingford, Ireland, 13 April 1825; d. Ottawa, Ontario, 7 April 1868. He was connected with the Young Ireland party and was obliged to flee to the United States at 17, where he engaged in journalism. In 1845 he returned to Ireland, but his journalistic writings compelled him to again escape to the United States in 1848. McGee then edited the New York 'Nation' for two years, after which he became a Royalist and went to Canada, where he was editor of 'The New Era.' He entered Parliament in 1857 and was a member until his assassination, which was the result of his opposition to the Fenian movement. He published: 'History of Ireland' (1862); 'Speeches and Addresses of the British-American Union' (1865); etc.

McGee, W J, American scientist: b. in Dubuque County, Ia., 17 April 1853; d. Washington, D. C., 4 Sept. 1912. He was self-educated, and from 1873 to 1875 surveyed land and practised in the courts. In 1877–81 he made geologic and topographic surveys of northeastern Iowa, and for the United States Geological Survey he surveyed and mapped 300,000 square miles in the southeastern part of the country, and performed many other important services in the departments of geology, ethnology, and anthropology. From 1893 to 1903 he was ethnologist in charge of the Bureau of American Ethnology. He was president of the American Anthropological Association, chief of the Department of Anthropology and Ethnology of the Louisiana Purchase Exposition, and associate editor of the 'National Geographic Magazine.' He wrote: 'Geology of Chesapeake Bay' (1888); 'Pleistocene History of Northeastern Iowa' (1891); 'The Lafayette Formation' (1892); 'Potable Waters of the Eastern United States' (1894); 'The Siouan Indians' (1897); 'Primitive Trephining in Peru' (1898); and many scientific memoirs.

McGiffert, mạ-gĭf'ėrt, **Arthur Cushman,** American theologian and author: b. Sauquoit, N. Y., 4 March 1861. He was graduated at the Western Reserve College in 1882, and at Union Theological Seminary in 1885; and at Union studies at the universities of Berlin and Marburg, Germany, and in France and Italy. In 1888–90 he was instructor in Church history at Lane Theological Seminary, Cincinnati, and professor there 1890–3, since when he has been professor of Church History of Union Theological Seminary, New York. In 1897 he published 'A History of Christianity in the Apostolic Age,' and in cosequence of criticism and threatened denominational disturbance, involving his own probable trial for heresy, to which this book gave rise, he withdrew from the Presbyterian ministry, and later, while still retaining his professorship, joined the Congregational Church. His other publications include 'Dialogue Between a Christian and a Jew,' Doctor's thesis (1888), and a translation of Eusebius' 'Church History,' with prolegomena and notes (1890); 'The Apostles Creed' (1902).

McGiffin, mạ-gĭf'ĭn, **Philo Norton,** American naval officer: b. Washington County, Pa., 1860; d. New York 11 Feb. 1897. He was graduated in 1882 at the United States Naval Academy, and was stationed in China, and at the outbreak of the war between China and France was permitted to resign from the United States navy to enter the service of China. He established a naval academy at Wei-hai-wei, of which he had charge. When the China-Japan war broke out he was placed in command of the Chen Yuen, and was the first American or European to command a modern warship in action. He was in command at the battle of Yalu River, in which action he was so severely injured that he afterward shot himself at a hospital in New York.

McGill, mą-gĭl', **James,** Canadian philanthropist: b. Glasgow, Scotland, 6 Oct. 1744; d. Montreal, P. Q., 19 Dec. 1813. He was educated in Glasgow and in 1770 removed to Canada, where he engaged in the northwest fur-trade, afterwards becoming a merchant in Montreal. McGill was a member of the lower Canadian parliament, also of various councils, and was a brigadier-general in the War of 1812. He used much of his wealth in philanthropic work and at his death founded McGill College (q.v.) in Montreal.

McGill College and University, in Montreal, Canada, was founded in 1811 by James McGill (q.v.). By will he left an estate known as the «Burnside Estate,» which contained 47 acres of land and a fine Manor House, near Montreal, and £10,000 to the «Royal Institution for the Advancement of Learning,» for the establishment of a university in Lower Canada (province of Quebec). The bequest was valued at the time as worth about $120,000. It was stipulated that one of the colleges of the university should be known in perpetuity as McGill College.

McGill College and University stands at the head of a group of schools and colleges and is affiliated with Cambridge, Oxford, and Dublin universities. Many generous benefactors have supplied means for the foundation of various schools. Lord Strathcona and Mount Royal erected and endowed the Royal College for Women. This school is a residential college, and is only one of many gifts from the same donor. Sir William Macdonald erected, equipped, and endowed the Macdonald Chemistry and Mining Building, the Macdonald Physics Building, and the Macdonald Engineering Building. He also gave $200,000 endowment to the Law School. Peter Redpath gave the University Library and the Peter Redpath Museum.

The degrees conferred by the University are B.A., M.A., B.Sc., M.Sc., D.Sc., and D. Litt., in the Faculty of Arts, and to both men and women; B.C.L. and D.C.L. in the Faculty of Law; B. Arch., B.Sc., M.Sc., and D.Sc. in the Faculty of Applied Science, and M.D., and C.M. in the Faculty of Medicine. There are four affiliated theological colleges which adjoin the university grounds. The supreme authority rests with the Crown and is exercised by the Governor-general of Canada. The Governors, fifteen in number, are the members of the «Royal Institution for the Advancement of Learning» above mentioned. The president of the Board of Governors is ex-officio the chancellor. The vice-chancellor is the principal, who is the head of the academic department and chief administrative officer. He is ex-officio the vice-chancellor. The Fellows number 43, and are chosen from all the faculties, affiliated colleges and other bodies, with due regard to the representation of each. There are connected with the university about 1,300 students and 200 professors and lecturers, besides a large number of demonstrators. The library contains about 110,000 volumes. The grounds and buildings are valued at more than $2,000,000. The university is increasing its fine plant and equipment as fast as its finances will permit.

J. A. Nicholson,
Registrar of the University.

MacGillicuddy (mą-gĭl-ĭ-kŭd'ĭ) **Reeks,** Ireland, a picturesque mountain range, in County Kerry, extending for 13½ miles from the lakes of Killarney on the east to Lough Carra on the west, and covering an area of 28 square miles. It is the loftiest mountain range in Ireland, several peaks rising above 2,500 feet.

McGillivray, mą-gĭl'ĭ-vrā, **Alexander, chief** of the Creek Indians: b. in Alabama about 1740; d. Pensacola, Fla., 17 Feb. 1793. His father was a Scotsman of good family and his mother a half-breed. He received a good education at Charleston, S. C.; was placed in a mercantile establishment in Savannah; but soon returned to the Creek country, where he became partner in a large trading house, and rose to a high position among the Indians. After the death of his mother he became chief of the Creeks, styling himself their emperor. During the Revolution the McGillivrays, father and son, were zealous adherents of the royal cause, the former holding the rank of a colonel in the British service. After the war Alexander McGillivray, in behalf of the Creek confederacy, entered into an alliance with Spain, of which government he was made a commissary, with the rank and pay of colonel. In 1790 he was induced by Washington to visit New York, where he eventually signed a treaty yielding certain disputed lands lying on the Oconee. He was rewarded with an appointment as agent for the United States, with the rank and pay of brigadier-general.

McGilvary, Evander Bradley, American linguist and philosopher: b. Bangkok, Siam, 19 July 1864, of American parents. He was educated at Bingham School, N. C., and Davidson College, graduating at the latter in 1884. He was appointed as instructor in the classics at Bingham School in 1884, and in 1889–90 studied at Princeton Theological Seminary. From 1891 to 1894 he was translator for the Presbyterian Board of Foreign Missions in Siam, and in 1894 began graduate work at the University of California, where he later became assistant professor. In 1899 he was appointed Sage professor of moral philosophy at Cornell. He has translated the Gospels of Matthew, Luke and John, and the Acts of the Apostles into the Lao dialect of Siamese.

McGlynn, mą-glĭn', **Edward,** American clergyman: b. New York 27 Sept. 1837; d. Newburg, N. Y., 7 Jan. 1900. He was educated at the College of the Propaganda in Rome, and from 1866 was pastor of St. Stephen's Church in New York. He favored the education of children by the State rather than in parochial schools, and in 1886 warmly supported the candidacy of Henry George for the mayoralty, thereby bringing upon himself the censure of the Church. He was summoned to Rome to exculpate himself, but refused to go, pleading his

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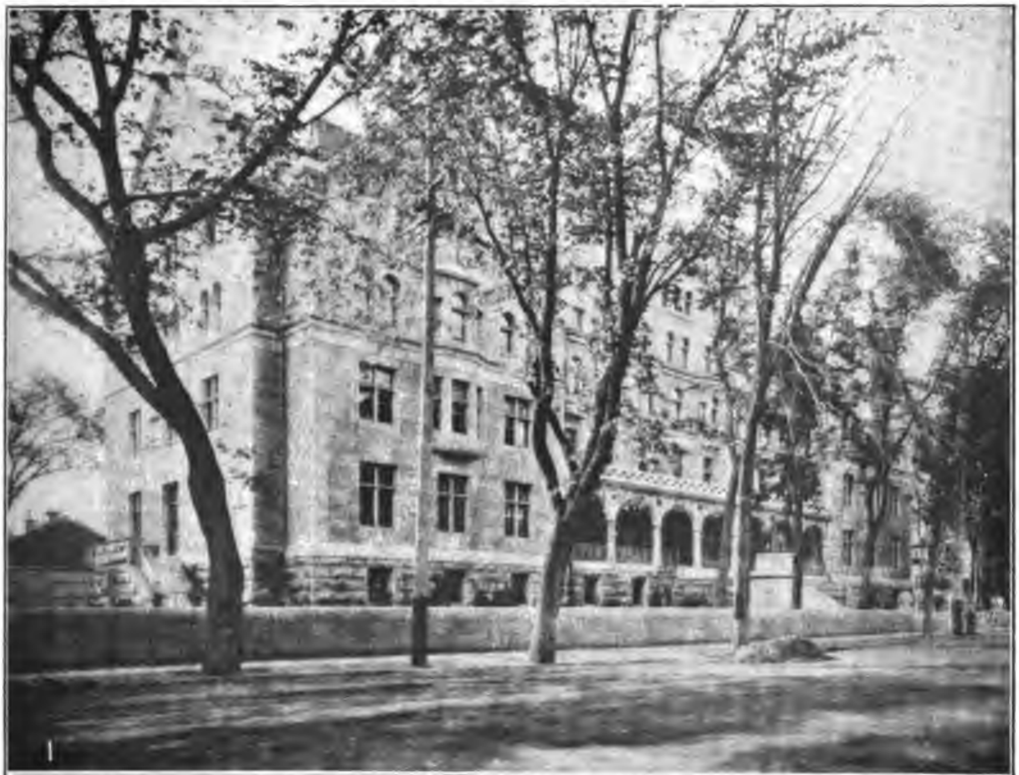

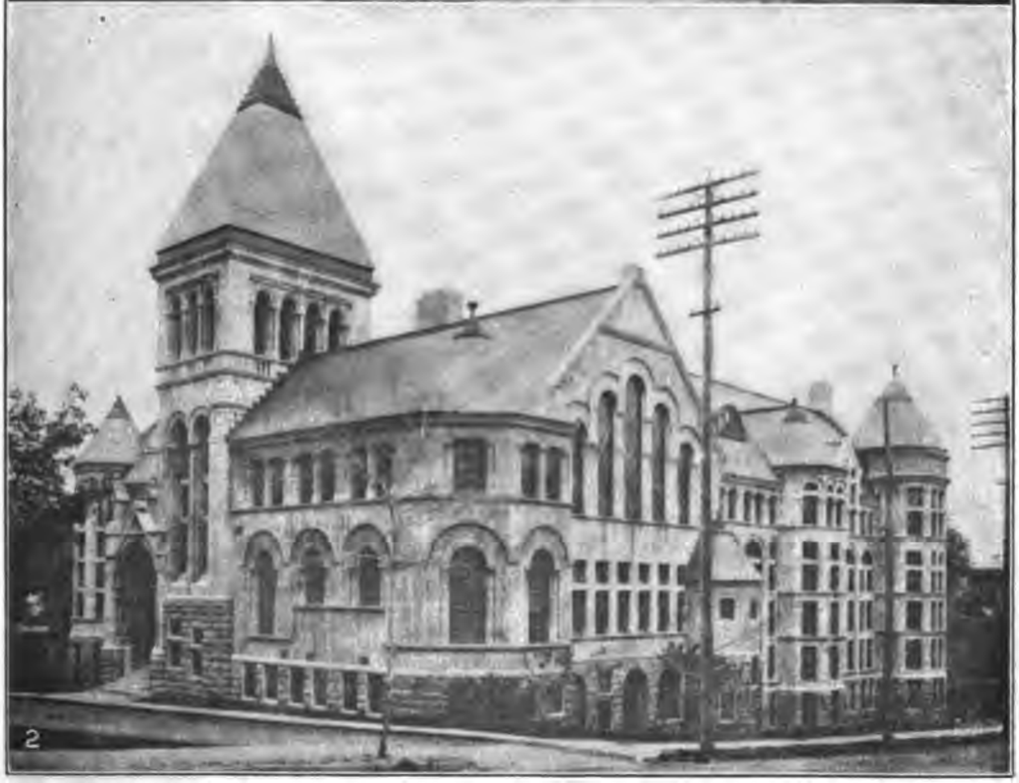

1. **Royal Victoria College for Women.**
2. **Library Building.**

ill-health. Persisting in his refusal he was excommunicated in 1887. He was one of the founders of the Anti-Poverty Society and was its president. In 1893, after a hearing before the Pope's delegate, Mgr. Satolli, the ban of excommunication was removed, after signing a document drawn up by the apostolic delegate to the effect that his economic views were not in conflict with the Catholic faith. He was in charge of St. Mary's parish in Newburg at his death.

McGovern, ma-gŏv'ĕrn, **John,** American author: b. Troy, N. Y., 18 Feb. 1850. He was connected for 16 years with the Chicago *Tribune*, and since 1880 has been engaged in literary work and lecturing, chiefly on great writers and historical characters. In the action of S. E. Gross, author of the play 'The Merchant Prince of Cornville,' against Edmond Rostand, author of 'Cyrano de Bergerac,' he acted as literary expert for the former, furnishing in the case over 700 exhibits containing innumerable parallels between the two dramas. The United States Court at Chicago issued a decree in 1902 sustaining the claim of Gross to priority of authorship and forbidding the representation of 'Cyrano de Bergerac' in this country. McGovern's numerous writings include: 'The Empire of Information' (1880); 'A Pastoral Poem' (1882); 'The Toiler's Diadem' (1885); 'Under the Open Sky' (1890); 'King Darwin,' a novel (1894); 'American Statesmen' (1898); 'Famous Women of the World' (1898); 'John McGovern's Poems' (1902); etc.

MacGow'an, John E., American journalist: b. Mahoning County, Ohio, 30 Sept. 1831; d. Chattanooga, Tenn., 12 April 1903. He was educated at Hiram College and practised law in Iowa and Ohio until the outbreak of the Rebellion in 1861, when he enlisted in the Federal army and served through the war; he was mustered out of service brevet brigadier-general. MacGowan's career as a journalist began in 1872 and he was prominently connected with the leading newspapers of Tennessee. He was a forceful writer and exerted a wide influence throughout the South. From 1878 until his death he was editor-in-chief of the Chattanooga *Times*.

MacGrady, ma-grā'dĭ, **Thomas,** American Roman Catholic clergyman: b. Lexington, Ky., 11 June 1863. He was educated at Saint Joseph's College, Bardstown, Ky., and after theological studies at Kankakee, Ill., was ordained to the priesthood April 1887. He served at the cathedral in Galveston, Texas, for a short time, and was then rector at Houston, Texas (1888–90); at Dallas, Texas; at Lexington and Cynthiana, Ky.; and at Saint Anthony's Church, Bellevue, Ky. (1895–1902). Besides attending to his clerical duties, he wrote and lectured frequently on economic and social subjects, and his views were so radical that he was severely criticised, and was requested by the ecclesiastical authorities to retract his writings, but refused to do so, and resigned from his position in December 1902, though not withdrawing from the priesthood. His writings are avowedly socialistic, and several of them are approved and sold by the Socialist party; they include 'The Mistakes of Ingersoll' (1898); 'The Two Kingdoms' (1899); 'Beyond the Black Ocean' (1901); 'City of Angels' (1901); 'A Voice from England' (1902); and 'The Clerical Capitalist' (1902).

McGrath', Harold, American journalist and novelist: b. Syracuse, N. Y., 4 Sept. 1871. He was educated in Syracuse. He has written: 'Arms and the Woman' (1899); 'The Puppet Crown' (1901); 'The Grey Cloak' (1903); 'The Princess Elopes' (1905); 'The Carpet from Bagdad' (1911).

McGready, ma-grā'dĭ, **James,** American Presbyterian clergyman: b. in Pennsylvania about 1760; d. 1817. He studied for the ministry in the school of John McMillan, of Canonsburg, Pa., and in 1778 was licensed to preach. After some years of work in North Carolina, in 1796 he removed to southwestern Kentucky, and under his direction began the great revival of religion which culminated in 1800 and became memorable in the religious history of the country. He organized and conducted the first camp-meeting, and employed as preachers unordained young men without special theological training, thereby provoking dissension in the Presbyterian Church. Out of this disagreement arose the Cumberland Presbyterian Church (see PRESBYTERIAN CHURCH), organized in 1810. McGready, however, afterward became reconciled to the older church and resumed his fellowship in it. Two volumes of his sermons were published years after his death, the first at Louisville, Ky., in 1831, the second at Nashville, Tenn., in 1833. Consult: Davidson, 'History of the Presbyterian Church in the State of Kentucky' (1847); Foote, 'Sketches of North Carolina, Historical and Biographical' (1850; 2d series, 1855); Smith, 'History of the Cumberland Presbyterian Church'; Edson, 'Early Presbyterianism in Indiana' (1898).

Machærodus, mā-kē'rō-dŭs, a genus of huge extinct cats, fossil in the Miocene and subsequent formations, and including the largest of the *Nimravidæ*. See SABRE-TOOTHED TIGER.

McHenry, James, American politician: b. Ballymena, Ireland, 1753; d. 1816. He had studied at Dublin, when, about 1771, he came to this country, and in Philadelphia soon entered upon the study of medicine under Dr. Benjamin Rush (q.v.). On the outbreak of the Revolution he became surgeon of the 5th Pennsylvania battalion; in November 1776 was taken prisoner at Fort Washington; was paroled in the following January, and in March 1778 exchanged. In May of that year he was made assistant private secretary to Washington, and held that position until October 1780, when as major he was appointed to a place on the staff of Lafayette. Elected in 1781 to the Maryland Senate, he continued a member of that body until 1786, being also during the second half of that period a delegate to the Confederation Congress. In 1787 he was made a member of the Constitutional Convention; in 1789 was elected to the General Assembly of Maryland, and sat in the Senate of that State, 1791–6, when he was appointed by Washington secretary of war, retaining that position in the Cabinet under John Adams' administration until 1800. As an ardent Federalist he used his influence in favor of a strong national defense, and was a zealous partisan of Alexander Hamilton. After resigning from Adams' Cabinet he spent the rest of his life in Maryland. Fort McHenry (q.v.) was named after him

McHenry, măk-hĕn'rĭ, **James,** American physician and author: b. Larne, Ireland, 20 Dec. 1785; d. there 21 July 1845. He was educated in Dublin and Glasgow and in 1817 emigrated to the United States and finally settled in Philadelphia, where he practised medicine and was engaged in mercantile business. In 1842 he was appointed United States consul at Londonderry and held that post until his death. Among his works are: 'The Usurper: an Historical Tragedy' (played in Philadelphia 1820); 'O'Halloran, or the Insurgent' (1824); 'The Betrothed of Wyoming' (2d ed., 1830); etc.

McHenry, Fort. See Fort McHenry.

Machete, ma-chā'tā, a short sword-like tool, half knife, half cleaver, used in Cuba and other countries of tropical America for cutting cane and as a weapon in war. It was first brought into prominence during the Cuban revolution.

Machias, mạ-chī'ạs, Maine, town, county-seat of Washington County; on the Machias River, and on the Washington County railroad; about 120 miles east by north of Augusta. It is about 12 miles from the mouth of Machias River. A trading post was established here in 1633, by Englishmen, but after a few months they were forced by the French to abandon the place. The first permanent settlement was made in 1763. and in 1784 it was incorporated as a town. It was besieged by the British from 1 August to 1 November 1777, and other attacks were made later. The original township of Machias was divided into East Machias, Machiasport, Marshfield, and Whitneyville.

The chief industries are ship-building, lumbering, and fishing. It has considerable coast trade. The principal buildings are the Government building, the court-house, the United States Marine Hospital, and the Porter Memorial Library. Pop. (1910) 2,089. Consult: 'Memorial of the Centennial Anniversary of the Settlement of Machias.'

Machiavelli, Niccolo, nē-kō-lō' mä-kē-ä-vĕl'lē or măk-ĭ-ạ-vel'lĭ, Italian historian and statesman, possibly the greatest prose writer of the Italian Renaissance: b. Florence 3 May, 1469; d. there 22 June 1527. Of Niccolo's early life and education we know nothing. No trace of him remains previous to his 26th year. But of his times and the scenes amid which he grew up, we know much. It was the calm but demoralizing era of Lorenzo the Magnificent. Machiavelli was a true child of his time. He too was thoroughly imbued with the spirit of the Renaissance; and looked back, fascinated, on the ideals of that ancient world that was being revivified for the men of his day. But philosophy, letters, and art were not the only heritage that the bygone age had handed down; politics — the building of states and of empire — this also had engaged the minds of the men of that age, and it was this aspect of their activity that fired the imagination of the young Florentine. From his writings we know he was widely read in the Latin and Italian classics. But Virgil and Horace appealed to him less than Livy, and Dante the poet was less to him than Dante the politician; for he read his classics, not as others, to drink in their music or be led captive by their beauty; but to derive lessons in statecraft, and penetrate into the secrets of the successful empire-builders of the past. It is equally certain, from a study of his works, that he had not mastered Greek. Like Ariosto, Machiavelli was indebted for his superb literary technique solely to the study of the literature of his own nation.

With the expulsion of the Medici from Florence, Machiavelli, at 30, emerged from obscurity to play a most important rôle in the Florentine politics of the succeeding decade and a half. In 1498 he was elected secretary to the Ten of War and Peace, and from 1498 to 1512 was a zealous, patriotic, and indefatigable servant of the republic. His energy was untiring, his activity ceaseless and many-sided. He conducted the voluminous diplomatic correspondence devolving upon his bureau, drew up memorials and plans in affairs of state for the use and guidance of the Ten, undertook the reorganization of the Florentine troops, and went himself on a constant succession of embassies, ranging in importance from those to petty Italian states up to those to the court of France and of the Emperor. He was by nature well adapted to the peculiar needs of the diplomacy of that day; and the training he received in that school must in turn have reacted on him to confirm his native bent, and accentuate it until it became the distinguishing characteristic of the man. His first lessons in politics and statecraft were derived from Livy's history of the not over-scrupulous Romans; and when he comes to take his lessons at first hand, it is in the midst of the intrigues of republican Florence, or at the court of a Caterina Sforza, or in the camp of a Cesare Borgia. Small wonder that his conception of politics should have omitted to take account of honesty and the moral law; and that he conceived "the idea of giving to politics an assured and scientific basis, treating them as having a proper and distinct value of their own, entirely apart from their moral value."

During this period of his political activity we have a large number of state papers and private letters from his pen; and two works of literary cast. These are his 'Decennale': historic narratives, cast into poetic form, of Italian events. The first treats of the decade beginning 1494; and the second, an unfinished fragment, of the decade beginning 1504. They are written in easy *terzine;* and are noteworthy as expressing the sentiment for a united Italy.

When in 1512 the Medici returned to Florence in the train of her invader, Machiavelli was dismissed from his office and banished for a year from the confines of the city. Later, on suspicion of being concerned in a plot against the Medici, he was thrown into prison and tortured. He was afterward included in a general pardon granted by Leo X. But Machiavelli did not return to public life until 1525; and this interval of enforced leisure from affairs of state was the period of his literary activity. A number of comedies, minor poems, and short prose compositions did not rise above mediocrity. But in one dramatic effort he rose to the stature of genius. His 'Mandragola' achieved a flattering success, both at Rome and in Florence. It has been pronounced the finest comedy of the Italian stage, and Macaulay rated it as inferior only to the greatest of Molière's. In its form, its spontaneity, vivacity, and wit, it is not surpassed by Shakespeare; but it is a biting satire on religion and morality, with not even a hint of a moral to redeem it.

His lesser prose works are the 'Life of Castruccio Castracani,' and the 'Art of War,' a treatise anticipating much of our modern tactics. A more ambitious undertaking, and his largest work, is the 'History of Florence.' At the suggestion of the Cardinal de' Medici, the directors of the studio of Florence commissioned Machiavelli to employ himself in writing a history of Florence, «from whatever period he might think fit to select, and either in the Latin or the Tuscan tongue, according to his taste.» He was to receive one hundred florins a year for two years to enable him to pursue the work. He chose his native tongue; and revised and polished his work until it became a model of style, and in its best passages justifies his claim to the title of the best and most finished of Italian prose writers.

But though Machiavelli had the historical style, he lacked historical perspective; he arranged his matter not according to objective value, but placed in the boldest relief those events that best lent support to his own theories of politics and statecraft. He makes his facts to be as he wishes them, rather than as he knows them to be. To Machiavelli history was largely to be written as a *Tendenzroman*,— manufactured to point a preconceived moral. Though Machiavelli wrote history, poetry, and comedy, it is not by these he is remembered. The works that have made his name a synonym, and given it a place in every tongue, were written almost in the first year of his retirement from political life: 'The Prince' and the 'Discourses on the First Ten Books of Titus Livius.' Each is a treatise on statecraft; together they form a complete and unified treatise, and represent an attempt to formulate inductively a science of politics. The 'Discourses' study republican institutions, 'The Prince' monarchical ones. The first is the more elementary and would come first in logical arrangement. But in the writing of them Machiavelli had in view more than the foundation of a science of politics. He was anxious to win the favor of the Medici; and as these were not so much interested in how republics are best built up, he completed 'The Prince' first, and sent it forth dedicated «to the magnificent Lorenzo, son of Piero de' Medici.» In the 'Discourses,' the author essays «a new science of statesmanship, based on the experience of human events and history.» In that day of worship of the ancient world, Machiavelli endeavors to draw men to a study of its politics as well as its art. In Livy he finds the field for this study.

In his commentary on the course of Romulus in the founding of Rome, we find the keynote of Machiavelli's system of political science. His one aim is the building of a state; his one thought, how best to accomplish his aim. Means are therefore to be selected, and to be judged, solely as regards their effectiveness to the business in hand. Ordinary means are of course to be preferred; but extraordinary must be used when needed.

In 'The Prince,' a short treatise of 26 chapters, and making little more than a hundred octavo pages, Machiavelli gives more succinct and emphatic expression to the principles of his new political science. It is the best known of all his works. It is the one always connected with his name, and which has made his name famous. For the model of his prince, Machiavelli took Cesare Borgia, and cites him as an example worthy of imitation; and he has shared in the execration that posterity has heaped upon Borgia. The strangest moral contradictions abound throughout 'The Prince,' as they do in all Machiavelli's writings. He is saint or devil according as you select your extracts from his writings.

Shakespeare, reflecting English thought, uses his name as the superlative for craft and murderous treachery. But later years have raised up defenders for him, and his rehabilitation is still going on. He has been lauded as «the noblest and purest of patriots»; and more ardent admirers could «even praise his generosity, nobility, and exquisite delicacy of mind, and go so far as to declare him an incomparable model of public and private virtue.»

His rehabilitation proceeds from two causes. Later research has shown that perhaps he only reflected his time; and his works breathe a passionate longing for that Italian unity which in our day has been realized. He may be worthy canonization as a national saint; but those who are more interested in the integrity of moral standards than in Italian unity will doubtless continue to refuse beatification to one who indeed knew the Roman *virtus*, but was insensible to the nature of virtue as understood by the followers of Christ. And no amount of research into the history of his age can make his principles less vicious in themselves. A better understanding of his day can only lessen the boldness of the relief in which he has heretofore stood out in history. He was probably no worse than many of his fellows. He only gave a scientific formulation to their practices. He dared openly to avow and justify the principles that their actions implied. They paid to virtue the court of hypocrisy, and like the Phariseee of the earlier time, preached righteousness and did evil; but Machiavelli was more daring, and when he served the devil, disdained to go about his business in the livery of heaven. Among the editions of the collective works of Machiavelli may be mentioned those of Milan, 1810–11; Florence, 1813; Milan, 1821–2; Florence, 1826, 1843; and Florence (6 vols., 1873–7); Boston English translation (1891). Consult Villari, 'Niccolo Machiavelli e i suoi tempi, (1877–82), English translation (1892); Tommasini, 'La vita e gli scritti di Niccolo Machiavelli (1882); Mourrisson, 'Machiavel' (1883).

Machine Composition. See COMPOSING MACHINES.

Machine Engraving, a mechanical process for engraving on wood, metal or stone. Since 1880 numerous machines have been invented to produce regular tints, geometrical and other designs and patterns, far more rapidly than by hand work. The most complex engraving is now executed wholly by machinery. Engraving by mechanical means is now generally employed in the making of bank-notes, diplomas, stock certificates and other papers and documents, where special designs are required. Elaborate gearing systems have been introduced whereby the cutting tools execute a certain number of symmetrical motions and thus produce elaborate geometrical patterns.

Machine Gun. See ORDNANCE.

Machinery-Manufacturing Industry in America. Owing to the restrictive measures of Great Britain this industry got a late start in

America; but once a beginning had been made, the very laws by which the mother country sought to make us dependent on her proved more effective in the development of our machinery-manufacturing industry than the most rigid system of protective tariff would have been. Great Britain wished to confine manufactures to her shores and compel the American colonists to buy their manufactured articles from English factories. At first the colonists were not allowed either to manufacture or to import machinery. In the year 1774 a statute was enacted by Parliament instituting the restrictive system as to textile machinery. This statute was made more stringent in 1781, and it was not actually repealed till 1845. This act prohibited the exportation of "any machine, engine, tool, press, paper, utensil, or implement whatever, which now is, or may at any time be, used in or proper for the preparing, working, pressing, finishing, or completing of the linen, cotton, wool, or silk manufactures of this kingdom, or any other goods wherein wool, silk, or cotton is used, or any part of such machine, etc., or any model or plan of any such machine," under penalty of forfeiture of the tools or machine, the payment of a fine of £200, and imprisonment for one year. Further, foreigners were prohibited, under a penalty of £500 and imprisonment for twelve months, "from seducing artificers, and others employed in the manufactories, to depart out of this kingdom; and if any artificer has promised or contracted to go into foreign parts to practise or teach his trade, such artificer may be obliged to give security, at the discretion of the court, that he shall not go beyond the seas, and may be committed to prison until he give such security."

These laws were rigidly enforced; and it was seldom that they were evaded. It was impossible even to smuggle a textile machine into this country; and the models that were surreptitiously imported were imperfect. Tench Coxe, the coadjutor of Alexander Hamilton in the Treasury Department, made arrangements to have models of Arkwright's patents sent to him; but before they could be shipped they were detected and forfeited. In 1786 the General Court of Massachusetts appointed a joint committee to investigate textile machinery; and this led later to the employment of Samuel Slater and to the real beginning of machinery-manufacture in this country. Slater landed at New York 17 Nov. 1789; and in the following January he made arrangements with Messrs. Brown & Almy, of Providence, R. I., to construct for them textile machinery on the English plan. He made most of the machinery with his own hands and set it up at Pawtucket, R. I. This was the first textile mill in this country to use the Arkwright system. It was opened 20 Dec. 1790. It must be remembered that Slater brought with him from England no implements to work with, and no plans or models. He had to carry everything in his head. Alexander Hamilton called him "the father of American manufactures"; but, in the first place, he was the father of American machinery. Up to the time of his coming there were no machines in this country, with the exception of the rude sawmill, gristmill, and fulling-mill; some rolling and slitting mills, foot-lathes, and a few rough carding and spinning appliances. The first carding-machine worked in the United States was constructed at Newburyport, Mass., in 1793, by John and Arthur Scofield. Until then the household looms were the only domestic source of supply of woolen cloth.

At this time the manufacture of metal working machinery was in its infancy. The lathe was known only in its simplest form, *i. e.*, two dead centres supporting the work as it was rotated backward and forward by a band around it, one end attached to a spring-pole above it, the other end to the foot of the operator, who held the turning-tool in his hand. Even after the lathe had been provided with a revolving spindle and centre to support and rotate the work, the tools used for turning both wood and iron were still manipulated by hand. The increasing demand for accurately-cut cylindrical iron pieces, which could not be made by hand led to the general use of the slide-rest. Formerly used only by the optician and the maker of mathematical instruments, it now became a necessary adjunct of the lathe. This gave the lathe practically unlimited capacity to turn out exact cylindrical work; but, in order for the slide-rest to do its work, it had to be manipulated by the workman. The next step was naturally the introduction of the slide-lathe, by which the rotation of the work and the advance of the cutting tool are accomplished automatically. Owing to the lack of suitable tools to make the long flat surfaces required in such a machine, the slide-lathe had a curious development. The hammer, file, cold-chisel, and straight edge were the only tools at hand. The planing-machine was the next development of the slide-rest. It worked an era in the life of the machinist as great as that of the slide-rest itself. It is doubtful when the first planning-machine was made in the United States; but we know that there were only four such machines in this country in 1838. With this machine the rough and uneven surfaces of castings could be smoothed and reduced to true planes. Till now the drill had been limited to a revolving vertical spindle. The boring-mill or vertical lathe was now possible and took its place in the machine-shop for the execution of a large class of turned work that did not require to be supported on centres, such as wheels to be keyed upon their shafts. In fact, the first development of the planing-machine was the key-seating machine. It was soon recognized that such a machine could be turned to other work, and further changes were made accordingly. It was provided with compound slide-rests, with a revoluble table mounted thereon and in this form it took its place as a standard tool in the machine-shop under the name of the slotting-machine. This planer, with its vertically movable tool, was the progenitor of a machine with similar attachments, but with its tool moving horizontally, upon which work could be conveniently shaped in a great variety of forms; and the shaping-machine, as it was called, soon became one of the standard tools of the machine-shop. Meanwhile, the old vertical spindle drill, with its compound tables, movable vertically and adjustable horizontally, in two directions at right angles with each other, had been supplemented by the horizontal drill, with similar tables, but with its drill-spindle parallel to the tables; and the further requirements in this direction had been supplied by the radial drill, in which the vertical drill-spindle is movable about a vertical axis, to which it is adjustable radially.

However, there were other factors entering into the development of our machinery industry. There were other requirements beside these machine-tools, and which these supplied inadequately. Screw-bolts and nuts were needed for putting the machines together. Originally iron screw-bolts had been made by means of a spit die provided with spiral threads, by rotating either the bolt or the die backwards and forwards until the thread was partly cut, while a taper-tap was screwed into the nut first from one side, then the other, until the bolt was found to fit into the nut. These bolts were not interchangeable. This primitive system of bolt-manufacture continued until 1847, when the solid die with sectional threads patented by Philetus W. Gates, was generally introduced. This die cut the thread at one pass, then the rotation was reversed to unscrew it from the bolt, which marked the thread and was liable to mutilate the die. No compensation for wear was possible. Nothing approaching perfection was attained until 1857, when William Sellers devised a bolt-machine in which dies to cut the thread at one pass, and adjustable to size, could be opened and closed while running continuously in one direction. Since then ordinary screw-bolts have been made interchangeable. In a few years this machine of Sellers' was introduced into England and also continental Europe. The gear-cutter was another of the early machine-shop tools. This was simply a revolving milling-cutter, mounted upon a spindle above the dividing-plate. The wheel to be cut was forced against this. The machine was adjusted by hand. Such work was slow and very expensive; and up to 1867 the teeth of nearly all wheels, even for fine machines, were cast. In this year a machine was devised by William Sellers which limited the work of the operative to adjusting the wheel to be cut to the cutter. The machine was otherwise automatic; and it was now possible for one workman to attend to several machines, thereby greatly diminishing the cost of such work. From that time cast wheels have been no longer allowable in first-class machines. Another typical machine-tool that deserves mention is the milling-machine. It has received its greatest development in this country, where it is used particularly in fashioning shapes in fire-arms.

Such machine-tools constitute the more important part of "metal-working machinery," as distinguished from the general group of "foundry and machine-shop products" in the United States census for 1900. Indeed, prior to that time we have no separate statistics for this branch of industry. At that time there were in the United States 397 establishments, representing an aggregate capital of $54,293,812, employing 29,436 people, and turning out annually products worth $44,385,229. While there is no basis for a comparison with former years, it is known that this industry has grown steadily. Ohio and Pennsylvania lead, the former with 68 establishments, representing a capital of $11,171,334, employing 6,123 people, and turning out products worth $10,012,739, the latter with 31 establishments, representing a capital of $11,179,822, employing 4,150, and turning out products worth $6,989,252. Massachusetts, New York, Connecticut, and Illinois can each show a greater number of establishments than Pennsylvania, but the aggregate capital and the value of the products of each of these States are smaller than in the Keystone State. Some of the items included in the total of $44,385,229 are, lathes of all kinds, $8,330,383; boring and drilling machinery, $2,779,983; milling-machines, $2,171,966; planers, $1,808,955; stamping, flanging, and forming machines, $1,180,960; slotters and shapers, $1,136,350, not to mention hammers, forging, riveting, sawing, threading, and polishing machines, etc., etc. This industry has become highly specialized now, and only the older establishments produce a number of different types of machines. New establishments usually make only one type of machine, or at most one class embracing tools of similar type. Some establishments make only engine-lathes, others only planers, others nothing but milling-machines. Cincinnati is the largest producer of this kind of machinery; and, since the industry is comparatively new there, the specialization is also greatest. Though the aggregate products of Philadelphia are less than those of Cincinnati, the Quaker city shows a much greater range in the variety of machinery produced. Other important centres are Providence, Rhode Island, Hartford, Connecticut, and Worcester, Massachusetts, their importance being in the order named. The effect of specialization has been to make machine-tools more efficient, and, it may be added, more varied. If, for instance, a new vehicle is designed, as the bicycle, or the motor-carriage, and strangely fashioned parts are required, a machine that will make these parts is always forthcoming.

The development of more accurate machinery, as indicated above, led to the system of interchangeability. In the manufacture of machinery this is an economic principle of the greatest importance. Under more primitive methods individual parts had to be fitted together with great difficulty and at much expense. Now all these parts are made by machines with such exactness that they are thoroughly interchangeable; and there is no longer any question as to their fitting. This method of manufacture has increased the output of the individual and has reduced the cost of production tremendously. As simple as the system may seem, it was slow in attaining its present perfection. Though first attempted in Europe, it remained for the United States to demonstrate its feasibility and actually put it into successful operation. Following the lead of this country Europe afterward adopted the system. For the economical manufacture of any kind of machinery in which many parts are to be interchangeable certain definite conditions must be met; and success economically requires that every part shall be finished without the intervention of a skilled workman. The machine must be so designed that it will not only work automatically but work with a high degree of accuracy. Reference standards must be provided with which to compare the several parts in order to determine the amount of variation permissible between the standard and the product; every part must come from the machine in the final finished form. Such are some of the details that make necessary a careful study of every part in order to design a machine that will perform each operation with the most efficiency.

The principle of interchangeability was first made use of in the United States in the manufacture of fire-arms in our government arsenals under the direction of Eli Whitney, the inventor of the cotton-gin. The growth of the system was slow, being confined for a long time to a few of the principal parts; but even in this undeveloped condition it proved successful economically. In 1822 Calhoun, who was Secretary of War then, remarked to Whitney that his improvements were saving the government $25,000 a year at the two public armories. By means of the drop forging-press, with dies conforming to the shape desired, Whitney was able to cut from red-hot metal all the smaller parts of a gun in a form closely approximating the finished article. These forged parts were then subjected to the more accurate milling-machine, which turned out the parts in uniform condition, no matter how varied their shape may have been when they came from the forging-press. It only remained for the drill to fashion the bearings for the working parts and bore the holes to secure the parts together. This was a comparatively simple matter when once the order of procedure had been determined and the guiding templets provided. The wooden stocks of the gun were also made by machinery and with sufficient accuracy to make them interchangeable. This was accomplished by means of a turning-lathe designed by Thomas Blanchard and patented by him in 1820. After the stock came from the lathe the groove for the barrel and the cavity for the lock were hollowed out by special machinery. Measured by the standards of to-day all this work was crude; but the gun of that day was itself crude, and these roughly interchangeable parts served their purpose. Machine-tools were then both inaccurate and limited in variety, so that they could not be expected to turn out the various parts with mathematical accuracy. Further, at that time there were no such delicate measuring instruments as we have to-day. The most refined measuring instrument known then was the vernier caliper; and the smallest deviation from the standard that could be detected with this contrivance was, at best, perhaps the thousandth part of an inch. The form of the screw-thread was not even susceptible of determination with any degree of accuracy. Since then has come great developments in the quality of machine-tools and in their wonderful adaptability to changing needs. Measuring instruments have now been so highly developed that a variation of the twenty thousandth part of an inch can be detected immediately and with perfect accuracy. Such delicate measuring appliances were first made by the Pratt & Whitney Company, from designs of Prof. W. A. Rogers and Mr. George M. Bond. The type of screw-threads now employed make possible a degree of accuracy that was undreamed of in the early days of this industry.

Foreign countries did not remain indifferent to the success of the United States in the employment of the principle of interchangeability of parts. Various commissions were appointed to investigate the system; and, as remarked above, the economic success of the United States in producing interchangeable parts led to the adoption of this method in Europe. Other countries had experimented with the plan; but, as in the case of many other things, it remained for American energy and inventive genius to put the plan into execution. Between 1870 and 1880 our large machinery manufacturers were kept busy filling foreign orders, especially for gun machinery. Large orders for such machinery were received from the German government; and it was even stipulated in the contract that the manufacturers should send over men to set up the machinery and instruct native workmen how to run it. Other governments began to look to us for their machinery; and thus our system for the manufacture of interchangeable parts was gradually established in England and continental Europe. In brief, we have led in the manufacture of this sort of machinery. For more than half a century this country has been in possession of a system of manufacture peculiarly its own. This principle of interchangeability, first applied to the manufacture of the larger class of fire-arms, then to pistols, has now been extended to practically every kind of machine. The sewing-machine, the typewriter, the bicycle, the watch, and the various kinds of agricultural machinery (q.v.) may be mentioned as types showing the economic value of the principle of interchangeability. In all these machines, and others, we lead the world. It seems that all our large machinery manufacturers are represented in foreign countries, and certain types of American typewriters, sewing-machines, cash registers, mowing-machines, reapers, etc., are just as well known there as they are here. American textile machinery and shoe-making machinery play an equally important part. In the manufacture of certain kinds of motor-carriages, as the light steam runabout and the electric carriage, America now leads the world. In general, America has been particularly successful in manufacturing transportation machinery. At the last census there were in the United States twenty-eight establishments whose sole or chief product was locomotives. In 1900 more than 3,000 locomotives were built in this country; and of these 525 were exported, as against 161 in 1890. What was said of the increasing price of machine-tools holds good for locomotives. The demand is for larger and more powerful machines; and, while in 1890 the average price of 2,400 locomotives built in that year was $8,199, in 1900 the average price had increased to $9,777. Pennsylvania leads in this branch of machinery. In 1900 the eight locomotive works in this State turned out 44.6 per cent. of the total product. American machinery of all kinds is distinguished for superiority in construction and design; and for this reason the exports are large and the imports small, despite the lower price of foreign machinery.

It is impossible to give statistics for our machinery-manufacturing industry as a whole, since, with a few exceptions, the United States Census does not separate it from foundry and machine-shops in general. While foundries produce much that is not properly machinery, the total figures given by the United States Census for 1900 will give some idea of the magnitude of this industry. At that time the number of machine-shop establishments in the United States was 9,234, with an aggregate capital of $665,058,245, and giving employment to 350,327 people. See HARDWARE INDUSTRY; AGRICULTURAL MACHINERY AND IMPLEMENTS; and articles on special types of machinery.

Machol', or **Mahhol'** (Hebrew), a word in the Old Testament, associated with «toph» (timbrel), and almost always rendered in the English version by «dances» or «dancing.» It is not improbable that *machol* and *toph* may mean «pipe and tabor,» as these two instruments are often associated with dancing.

McIlhenney, măk-ĭl-hĕn'ĭ, **Charles Morgan**, American landscape painter: b. Philadelphia 4 April 1858; d. 1904. Having studied under Frank Briscoe, he continued his training at the Academy of Fine Arts in Philadelphia, and soon began to win recognition in his chosen field. Among his best known works are 'A Gray Summer Noon' (1884), and 'The Passing Storm' (1887). In 1893 he was awarded medals at the Columbian Exposition and won the first Hallgarten prize.

McIlvaine, Charles Pettit, American Protestant Episcopal bishop: b. Burlington, N. J., 18 Jan. 1799; d. Florence, Italy, 13 March 1873. He was graduated at the College of New Jersey (now Princeton University), in 1816; entered the Princeton Theological Seminary in the same year, and was ordained deacon in 1820 and priest in 1821. His first pastoral charge was at Georgetown, D. C., which he left in 1825 to become professor of ethics at the United States Military Academy, West Point. He became rector of St. Ann's Church, Brooklyn, in 1830, and in 1831 undertook the duties of the professorship of the evidences of religion and sacred antiquities in the University of the City of New York. He did not long hold the chair, however, as he was the next year elected bishop of Ohio, to succeeded Bishop Chase, who had resigned the see. The question of the legality of such a resignation excited considerable interest in the General Convention of that year, but in the interest of the diocese both houses agreed in approving Dr. McIlvaine's testimonials, and he was accordingly consecrated in St. Paul's Chapel, New York. Upon his removal to Ohio he was elected president of Kenyon College, Gambier, founded by Bishop Chase, and held the position until 1840, acting also for some years as president of the Theological Seminary in the same place. During his long episcopate he came to be recognized as one of the most influential leaders of the Evangelical or Low Church party in America, and his ability and courtesy were cordially recognized by those who differed from him most widely. During the Civil War he was one of the four ambassadors informally appointed by President Lincoln to set before the English people what was considered in the North the real significance of the War. He published various sermons, addresses, and more important theological works, mainly directed to defending the positions of his party in the Church.

McIntosh, măk'ĭn-tŏsh, **Lachlan**, American soldier: b. near Inverness, Scotland, 17 March 1725; d. Savannah, Ga., 20 Feb. 1806. He came with his father to Georgia in 1736, received there an ordinary English education, became a clerk in the mercantile establishment of Henry Laurens at Charleston, S. C., and was later employed as a land surveyor. At the opening of the Revolution he was made colonel of the 1st Georgia battalion, and became a brigadier-general in 1776. In 1777 he fought a duel with Button Gwinnett (q.v.), who was fatally wounded. In 1778 McIntosh was selected by Washington to lead a small force against the Western Indians, whom he subdued. In the siege of Savannah, 1779, he bore an active part. When Charleston surrendered to Sir Henry Clinton 12 May 1780 McIntosh was taken prisoner, and he never resumed his command. He was a member of the Continental Congress in 1784, and the next year as commissioner to the Indians he finished his public services.

MacIntosh, Maria Jane, American author: b. Sunbury, Ga., 1803; d. Morristown, N. J., 28 Feb. 1878. In 1835 she removed to New York; and having suffered pecuniary reverses resorted to her pen for support, publishing in 1841 'Blind Alice,' under the pseudonym of «Aunt Kitty,» by which she continued subsequently to be known. It was followed by 'Conquest and Self-Conquest,' 'Praise and Principle,' and other tales between 1841 and 1846, each designed to inculcate some moral sentiment. In 1846 she published a work entitled 'Two Lives, or to Seem and to Be,' and in 1847 her stories were collected in a single volume as 'Aunt Kitty's Tales.' Other works are: 'Charms and Counter-Charms' (1848); 'Donaldson Manor' (1849); 'Woman in America' (1850); 'The Lofty and the Lowly' (1853); 'Violet, or the Cross and the Crown' (1856); 'Meta Gray' (1858); 'Two Pictures' (1863).

McIver, Charles Duncan, American educator: b. Moore County, N. C., 27 Sept. 1860; d. 17 Sept. 1906. He was graduated from the University of North Carolina in 1881, adopted teaching as a profession and after organizing the public schools of Winston and Raleigh, became one of the faculty of Peace Institute, Raleigh, in 1886. He was State Institute conductor, 1889-92, and held important educational posts in his native State, as chairman of the committee of the Teachers' Assembly in 1891 assisting in securing the establishment of the North Carolina Normal and Industrial College. In 1892 he became the first president of this institution, the only college for women in the State receiving an annual appropriation from the public funds. He was a member of the Southern Educational Board, which controls the Peabody Fund.

Mack von Leiberich, māk fōn lī'bĕ rĭʜ, **Karl**, BARON, Austrian military officer: b. Nennslingen, Franconia, 24 Aug. 1752; d. Saint Polten, Austria, 22 Oct. 1828. He entered the army of Austria in 1770, and was in 1797 created field-marshal. After the peace of Campo Formio, he was appointed by the King of Naples to the command of his troops, and took the field against the French and occupied Rome; but a riot in Naples, caused by his having concluded an armistice with the French, forced him to take refuge in the French camp. He was carried prisoner to Paris, but escaped in 1800 and in 1805 was sent to check the French advance along the line of the Iller. But the enemy shut him up in Ulm, and on Oct. 17 Mack capitulated with his army. He was tried by court-martial, but the sentence of death was commuted by the Austrian emperor to expulsion from the army and 20 years' imprisonment. In 1808 Mack was liberated, and in 1819 fully pardoned.

Mackay, mạ-kā' or mạ-kī', **Charles**, English poet, journalist, and miscellaneous writer: b. Perth, Scotland, 27 March 1814; d. London

24 Dec. 1889. He was editor of the 'Illustrated London News,' 1852–9, lectured in the United States, 1857–8, and was a special correspondent of the London *Times* in New York during the Civil War (1862–5). He was famous for his songs, many of which he set to music of his own. 'Cheer, Boys, Cheer,' is the best known of these. Among his many books are: 'The Salamandrine, or Love and Immortality' (1842); 'Voices from the Crowd' (1846); 'Voices from the Mountains' (1847); 'History of the Mormons' (1851); 'Lost Beauties of the English Language' (1874); 'Forty Years' Recollections' (1878); 'Through the Long Day' (1887); 'A Dictionary of Lowland Scotch' (1888).

Mackay, Clarence Hungerford, American capitalist: b. San Francisco 17 April 1874. The son of J. W. Mackay (q.v.), he succeeded on the death of his father to his vast business interests. Much of his boyhood was spent in France, and he was educated at Vaugirard College, afterward studying at Beaumont College, Windsor, England. He became proficient in modern languages, several of which he speaks fluently.

McKay, Donald, American shipbuilder: b. Nova Scotia 1810; d. 1880. He went to New York and learned ship-building, and began the business at Newburyport, Mass. At East Boston, in 1845, he established a shipyard where he built many large trading ships of the clipper model, in which he made great improvements. The Great Republic, which he built, a ship of 4,500 tonnage, was a larger vessel than had ever before been seen.

Mackay, George Eric, English poet, son of Charles Mackay (q.v.): b. London 25 Jan. 1851; d. 2 June 1898. Among his works are: 'Songs of Love and Death' (1865); 'Ad Reginam' (1881); the popular 'Love Letters of a Violinist' (1886); 'A Lover's Litanies' (1888); 'Nero and Actæa,' a tragedy (1891); 'My Lady of Dreams' (1895); 'Arrows of Song' (3d ed. 1896); 'A Lover's Missal' (1898).

McKay, Gordon, American inventor and manufacturer: b. Pittsfield, Mass., 1821; d. Newport, R. I., 19 Oct. 1903. He was the son of a cotton manufacturer, and at 12, on the death of his father, learned civil engineering, at which he worked for some time. Before he was 21 he built a machine-shop in Pittsfield which employed 100 men, and later became treasurer and manager of the Lawrence Machine Company. He was the first successful inventor of machinery for making boots and shoes; he perfected a shoe sewing-machine, invented, but not made practicable, by L. R. Blake, of Abington, Mass.; afterward invented the heeler, lasting-machine, nailing-machine, etc., which came into general use; and by these inventions revolutionized the boot and shoe industry of the world. At the outbreak of the Civil War he offered to make the shoes for the Union army, and within three years had leased his machines to more than 60 firms, and shortly became a millionaire. In 1878 he formed the McKay Sewing-Machine Association, a strict monopoly which exacted commissions on all shoes made in the United States by the aid of his inventions, and also brought profit through European royalties. In 1893 he placed $4,000,000 in a trust fund for Harvard University. He made many other liberal donations for benevolent and educational objects, and established near Kingston, R. I., the McKay Institute for the manual training of colored youth. By his will the greater part of his estate was left to Harvard.

Mackay, John William, American capitalist: b. Dublin, Ireland, 28 Nov. 1831; d. London 20 July 1902. His parents brought him to New York in 1840, and he learned ship-building. He went to California as a miner in 1851, and afterward to Nevada, where he continued mining with great perseverance in the face of many disappointments. In 1872 he was one of the discoverers of the Bonanza mines of the Comstock Lode (q.v.), in which mines he obtained a two fifths share, and became very wealthy. He and his partners, Fair, Flood, and O'Brien, founded the Bank of Nevada, of which Mackay was president for years. His relations with Jay Gould being unfriendly, in a spirit of opposition to him, and to the Western Union Telegraph Company, Mackay in 1884 joined with James Gordon Bennett in forming the Commercial Cable Company and the Postal Telegraph Company. He succeeded in laying two cables, overcoming great obstacles, and afterward won in a long rate-war with the old lines. The Roman Catholic Orphan Asylum at Virginia City, Nev., founded by him, is noteworthy among his many public benefactions.

Mackay-Smith, Alexander, American Protestant Episcopal bishop: b. New Haven, Conn., 2 June 1850. He was graduated from Trinity College, Hartford, in 1872, entered the Episcopal ministry and took priest's orders in 1877. After holding rectorships in South Boston, Mass., and New York successively, he was rector of St. John's, Washington, D. C., 1893–1902. In the year last named he was consecrated coadjutor-bishop of Pennsylvania.

Mackaye, mạ-kā', **James Steele,** American playwright: b. Buffalo, N. Y., 1844; d. Timpas, Colo., 25 Feb. 1894. In 1868 he went to Paris to study painting; but having there met Delsarte (q.v.) became interested in the latter's theories, and studied dramatic expression. In 1870–1 he gave in New York and Boston lectures on the art of expression. He opened the St. James Theatre at New York in 1872, and appeared there in 'Monaldi,' adapted by himself from the French. In 1873–5 he was studying the drama in Paris and England, and at the Crystal Palace, London, he played the title-rôle in 'Hamlet.' His adaptation of Blum's 'Rose Michel' in 1872 ran for 122 nights at the Union Square Theatre, New York. He established in New York the Lyceum School of Acting, which later became the American Academy of Dramatic Arts. For several years he was manager of the Madison Square theatre, and in 1885 built the Lyceum. Among his further plays were: 'Won at Last'; 'Through the Dark'; 'Hazel Kirke'; 'A Fool's Errand'; 'In Spite of All'; 'Paul Kauvar.'

McKean, mạ-kēn', **Thomas,** American patriot and jurist, signer of the Declaration of Independence: b. New London, Chester County, Pa., 19 March 1734; d. Philadelphia 24 June 1817. He was privately educated at Newcastle, Del.; having settled there, he studied law and was admitted to the bar in 1755; at once became register of probate, and was soon made assistant attorney for Sussex County. With Cæsar Rodney (q.v.), in 1762, he entered upon a revision of Delaware laws up to 1752, and was chosen in the same year to the Delaware Assembly, in which his membership continued till 1779. Elected in 1765 to the Stamp Act Congress (see Stamp Act), he took a strong position in defense of colonial rights, and as judge of the common pleas in the same year permitted no stamped paper to be used in his court. About 1771 he began to practise law in Philadelphia, although retaining a Delaware residence, and from Delaware, in 1774, he was elected to the Continental Congress, in which he served nine years, including the entire period of the Revolution, and took a prominent part in its proceedings, being president of the Congress in 1781. He was not present at the signing of the Declaration of Independence, which he had advocated, but added his signature some years afterward. The Articles of Confederation, which he aided in drafting, were also signed by him. In Pennsylvania, where he had become well known, he was made chairman of the Committee of Safety in 1776, and from 1777 to 1799 was chief justice of the State. He became a strong supporter of Jefferson, and a leader of the Republican party of that day, and was governor of Pennsylvania from 1779 to 1808. With James Wilson he wrote 'Commentaries on the Constitution of the United States' (1790).

McKean, Thomas, American philanthropist: b. Philadelphia, Pa., 23 Nov. 1842; d. there 16 March 1898. In 1862 he was graduated at the University of Pennsylvania and entered upon a successful business career, becoming an officer in many railroad and financial corporations. He acquired a large fortune, which he spent freely in endowing educational and charitable enterprises, his various gifts to the University of Pennsylvania alone amounting to $300,000.

McKean, William Vincent, American editor: b. Philadelphia 15 Oct. 1820; d. there 29 March 1903. He was a type-founder's apprentice in 1836–46, held a government post in Philadelphia in 1846–50, studied law and was associate of John W. Forney (q.v.) in the editorship of 'The Pennsylvanian' in 1850–3. In 1853–6 he was chief-clerk and disbursing officer of the House of Representatives, and became secretary to James Buchanan. He was editor-in-chief of the Philadelphia *Inquirer* 1860–4, and from 1864 until 1891 editor-in-chief and general manager of the *Public Ledger*.

McKees (ma-kēz') **Rocks,** Pa., borough, in Allegheny County; on the Ohio River, and on the Pittsburg, C. & Y., and the Pittsburg & L. E. R.R.'s; opposite the city of Allegheny. The first permanent settlement was made about 1830 by John McKee. It was incorporated as a borough in 1892. It is situated in a bituminous coal region, and in the vicinity of a fertile agricultural section. The chief industrial establishments are railroad shops, iron and steel works, car works, wire mills, tannery, chain works, rolling-mills, glassworks, flour and lumber mills. The shops and mills employ about 5,500 men. The borough has nine churches, four public and two parish schools. The principal public buildings are the churches, schools, a Y. M. C. A. building, and a hospital. There are three banks having a combined capital of $325,000; and the business transacted amounts annually to over $1,000,000. The government is vested in a burgess and a council of seven members. There are a number of foreign-born inhabitants, chiefly Germans, Hungarians, Italians, and Russians; the native born predominate. Pop. (1900) 6,352; (1910) 14,702. A large number of the employees in the machine shops and steel works reside outside the borough limits.

John E. Schramm,
Editor McKees Rocks 'Gazette.'

McKees'port, Pa., city, in Allegheny County; at the junction of the Monongahela and the Youghiogheny rivers, and on the Pennsylvania, the Pittsburg & L. E., and the Baltimore & O. R.R.'s; about 10 miles southeast of Pittsburg. The first permanent settlement was made in 1795 by David McKee, after whom the place was named. It was only a small village until 1829, when coal mining began on an extensive scale. It was incorporated as a borough 3 Sept. 1842, and chartered as a city 1 April 1890.

McKeesport is situated in a region noted for its extensive fields of bituminous coal and its natural gas. The chief industrial establishments are steel and iron works, one of which, the National Tube Company, has 10,000 employees. There are about a dozen smaller establishments; railroad shops, glass works, locomotive works, and others, all together employing about 8,000 men. The city has a large trade in its own manufactures and in coal and lumber. The principal educational institutions are the public and parish schools, the Douglass Industrial College, the Gessley Business College, and the Carnegie Library. Some of its principal buildings are those of the schools mentioned (the high school cost about $168,000), the Young Men's Christian Association Hall, and 30 churches. There are 18 different religious denominations and 40 congregations in the city.

There are five banks, the combined capital of which is $1,100,000. The city officials are a mayor, who holds office three years, a council composed of 11 select and 22 common council members. The select members hold office four years, the common council members are elected every two years. The mayor appoints, subject to approval of the council, the board of health, the police and the street commissioners. The council elect the chief of the fire department, the water commissioners, and the city solicitor, and the board of education, the board of assessors, the treasurer, and comptroller are chosen by popular election.

The city owns and operates the waterworks. The annual municipal expenditures are about $320,000; the chief items of expense are, for schools about $155,000; waterworks, $55,000; police department, $55,000; fire department, $35,000. Pop. (1900) 34,227; (1910) 42,694. A large number of the people are foreign born, chiefly from Austria, Sweden, Germany, and Italy; but the native born predominate.

A. N. Lawson,
Managing Editor 'Daily News.'

MacKellar, ma-kĕl'ar, **Thomas,** American poet: b. New York 12 Aug. 1812; d. 29 Dec. 1899. Having learned the printer's trade in the publishing house of the Harpers, he went to Philadelphia as a proofreader in the stereotype foundry of Lawrence Johnson & Co., in time became a partner in the business, and finally its head, the new firm being styled MacKellar, Smiths & Jordan. Among his works may be mentioned: ‘Droppings from the Heart’ (1844); ‘Tam's Fortnight Ramble’ (1847); ‘The American Printer’ (1866); ‘Rhymes Atween-Times,’ containing ‘Let Me Kiss Him for His Mother’ (1873); and ‘Hymns and Metrical Psalms’ (1883).

McKelway, Saint Clair, American journalist: b. Columbia, Mo., 15 March 1845. In 1853 he came east and was educated in New Jersey, studied law and was admitted to the bar in New York in 1866, but never practiced. In 1868 he became Washington correspondent for the New York *World* and the Brooklyn *Daily Eagle,* and in 1870 a member of the editorial staff of the latter paper. From 1877 to '84 he was the editor of the Albany *Argus,* and in the latter year returned to Brooklyn to become editor-in-chief of the *Eagle,* which under his editorship maintained a high standard of excellence. He has been a regent of the University of the State of New York since 1883, a member of the historical societies of Long Island and Suffolk County, is director of the American Social Science Association; and lectures frequently on educational and political subjects.

McKendree, ma̤-kĕn'drĭ, **William,** American Methodist bishop: b. King William County, Va., 6 July 1757; d. near Nashville, Tenn., 5 March 1835. He served in the Continental army during the American Revolution, entered the Methodist ministry in 1787 and became a presiding elder nine years later. In 1801 he made a missionary tour beyond the Alleghanies and was an important factor in the evangelizing of that region. In 1808 he was elected bishop, being the first American born person to hold that office in the Methodist church. McKendree College (q.v.) was named in his honor. Consult ‘Life’ by Paine (1869).

McKendree College, in Lebanon, Ill., founded in 1828 under the auspices of the Methodist Episcopal Church, and first called Lebanon Seminary. In 1830 the name was changed, in honor of William McKendree, who gave his estate to the college. In 1839 a new charter was obtained whereby the school was granted university privileges. Abraham Lincoln rendered valuable services in securing the new charter. Students are admitted on certificates from approved schools or on examinations. It has classical, scientific, music, law, and graduate departments. The degrees to which the courses lead are A.B. and B.S. In 1910 there were connected with the school 12 professors, and 190 students in the academic and college departments, and 80 students in music. The library contained about 12,000 volumes. The endowment fund was about $50,000, and the annual income $11,000. The estimated value of the college grounds and buildings was nearly $70,000.

McKenna, ma-kĕn'a̤, **Joseph,** American jurist: b. Philadelphia 10 Aug. 1843. In 1855 he went to California and was graduated from the Benicia Collegiate Institute in 1865, and admitted to the bar the same year. He was district attorney of Solano County in 1866–8, and in the sessions of 1875 and 1876 served as a Republican in the lower house of the California legislature. In 1885–93 he was a California representative in the 49th, 50th, 51st and 52d Congresses, resigning from the House in 1893 to accept the appointment to the office of United States circuit judge in the 9th Federal judicial district. This post he resigned to become attorney-general in the cabinet of President McKinley in 1897. On 16 Dec. 1897 he was made an associate justice of the United States Supreme Court to succeed Justice Field, retired, and on 26 Jan. 1898 took his seat. As circuit judge at San Francisco McKenna displayed much skill in the exposition of international law and the construing of treaties.

Mackenzie, ma̤-kĕn'zĭ, **Sir Alexander,** Scottish explorer: b. Inverness, Scotland, 1755; d. near Dunkeld 12 March 1820. He went to Canada when young, where he entered the employ of the Northwest Fur Company. In 1789 he explored the great river named after him from the western end of Great Slave Lake to the Arctic Ocean, made another expedition to the western coast (1792), and was the first white man to cross the Rocky Mountains and reach the Pacific coast. He returned to Britain in 1801, and for his explorations received the honor of knighthood in 1802. He published ‘Voyages from Montreal through the Continent of North America to the Frozen and Pacific Oceans in 1789 and 1793.’

Mackenzie, Alexander, Canadian statesman: b. Logierait, Perthshire, Scotland, 28 Jan. 1822; d. Toronto, Ontario, 17 April 1892. He emigrated to Canada in 1842. For five years he worked at the trade of a stonemason at Kingston, but then removed to Sarnia, where he became a contractor. But his chief interests were commercial, not political. In 1852 he began the Lambton ‘Shield,’ and soon became conspicuous as one of the Liberal leaders. He entered the Canadian Parliament in 1861, and after the Confederation of Canada, in 1867, sat both in the Ontario legislature at Toronto and in the Dominion Parliament at Ottawa. When the Hon. Edward Blake (q.v.) became prime minister of Ontario, in 1871, Mackenzie joined his cabinet, and became provincial treasurer, but, in consequence of a law forbidding membership of more than one legislature, he elected in 1872 to sit in the Dominion Parliament. In 1873, when the government of Sir John Macdonald was overthrown, Mackenzie, now the leader of the Liberal party, became prime minister of Canada, and held office for five years. His administration of public affairs was marked by rigid integrity. He himself took the great spending department of public works, and contractors found in him a vigilant watchdog of the treasury. His too great devotion to the details of his office broke down his health. In 1878 his government was defeated by the advocates of protection, and in 1880 he was obliged by ill-health to hand over the leadership of the Liberal party to Mr. Blake. Though he remained in Parliament for some years, he was never again able to take a prominent part in public affairs

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Mackenzie, Alexander Slidell (originally Slidell), American naval officer: b. New York 6 April 1803; d. Tarrytown, N. Y., 13 Sept. 1848. He was a brother of John Slidell (q.v.) and assumed the name «Mackenzie» for an uncle in 1837. He entered the navy in 1815 and became a commander in 1841. While in command of the Somers the next year a mutiny among the naval apprentices on board was supposed to have been detected, and three of them, including a son of the secretary of war, were hung from the yardarm on 1 Dec. 1842. He was a popular writer, and among his works are: 'A Year in Spain by a Young American' (1829–1831; enlarged ed. 1836), which attained great popularity in England and the United States; 'Popular Essays on Naval Subjects' (1833); 'The American in England' (1835); 'Life of John Paul Jones' (1841); etc.

Mackenzie, Henry, Scottish novelist and essayist: b. Edinburgh 25 Aug. 1745; d. there 14 Jan. 1831. He was a lawyer at Edinburgh; and in 1771 published anonymously 'The Man of Feeling' (1771), which gained him a conspicuous place among 18th century writers. Other novels of his are 'Man of the World' (1773); and 'Julia de Roubigné' (1777). He edited 'The Mirror' 1779–80, and 'The Lounger' 1785–87, papers on the plan of 'The Spectator'.

Mackenzie, Sir Morell, English laryngologist: b. Leytonstone, Essex, 7 July 1837; d. London 3 Feb. 1892. He was educated at the London Medical College, Paris and Vienna. In 1859 he met Czermak in Budapest and learning from him the use of the laryngoscope he introduced its use into London. Later he became physician to the London Hospital, and lecturer on diseases of the throat. In 1863 he founded the Throat Hospital in London. In 1887–8 he was associated with specialists of Berlin and Vienna in the treatment of the larynx disease of the Crown Prince, subsequently Emperor Frederick of Germany, and for these services was knighted by Queen Victoria, and received the Grand Cross and Star of the Hohenzollern Order of Germany. He was the author of 'The Use of the Laryngoscope' (1866); 'Diseases of the Throat and Nose' (1880); etc.

Mackenzie, Ranald Slidell, American soldier: b. Westchester County, N. Y., 27 July 1840; d. Staten Island, N. Y., 19 Jan. 1889. He was son of Alexander S. Mackenzie (q.v.). Graduated from West Point in 1862, he was assigned to the engineer corps, was wounded at Manassas and brevetted 1st lieutenant for services in that action. He was engineer of Sumner's division at Fredericksburg (13 Dec. 1862), and received the successive brevets of captain and major for his conduct at Chancellorsville and Gettysburg. Promoted captain of engineers 6 Nov. 1863, he took part in the Richmond campaign as commander of the 2d Connecticut artillery. On 18 June 1864 was brevetted lieutenant-colonel for services in the Petersburg siege, and commanded the 2d Connecticut heavy artillery in the Shenandoah campaign. He was present at Lee's surrender at Appomattox (9 April 1865), and was mustered out of the volunteer service 15 Jan. 1866. In 1882 he was made brigadier-general, and in 1884 placed on the retired list.

Mackenzie, William, Canadian financier: b. Kirksfield, Ont., 1848. He was educated at the local schools and became a public school teacher. Giving up this occupation he contracted for the construction of a portion of the Victoria Railway — now the Midland Division of the Grand Trunk Railway — and later executed contracts for the Coboconk, the Credit Valley, the Canadian Pacific, the Fort McLeod & Edmonton, the Regina, the Hudson's Bay and Dauphin Railways and other roads. He controls and is president of the Toronto Street Railway, is also interested in the Montreal and Winnipeg street railways, and with others controls the Birmingham Street Railway and other European lines. His great achievement was the construction of the Canadian Northern Railway (q.v.) of which he is president.

Mackenzie, William Douglas, American Congregational clergyman: b. Fauresmith, Orange River Colony, South Africa, 16 July 1859. He graduated from Edinburgh University in 1881, studied divinity in Edinburgh and Göttingen, was professor of theology in the Chicago Theological Seminary, 1895–1903, and since 1903 has been president of Hartford Theological Seminary. He published 'The Revelation of the Christ' (1896); 'Christianity and the Progress of Man' (1897); 'South Africa: its History, Heroes and Wars' (1900).

Mackenzie, William Lyon, Canadian journalist and political reformer: b. Dundee, Forfarshire, Scotland, 12 March 1795; d. Toronto 28 Aug. 1861. In 1820 he came to Canada, and conducted a drug and book store at Little York (now Toronto), and later at Queenstown, where in 1824–6 he published the 'Colonial Advocate.' He transferred the 'Advocate' office to Toronto in 1826, and there continued the paper until 1833, attacking the office-holding class and demanding governmental reforms. In 1828 he entered the provincial parliament; and having been expelled for alleged libel against that assembly, was five times re-elected and as often re-expelled, until the government refused to issue another writ of election. In 1832 he went to England, and having presented to the home government a petition of grievances from the Canadian reformers, was successful in obtaining the dismissal of the attorney-general and the solicitor-general of Upper Canada and the veto of the Upper Canadian bank bill. In 1834 he was elected first mayor of Toronto, in 1836 began the publication of 'The Constitution,' and, in 1837 published in that journal a bold manifesto which was practically a declaration of independence of the provincial government. Soon afterward he undertook armed rebellion. An encounter took place between his followers and the government forces at Montgomery's hill, in the vicinity of Toronto (7 Dec. 1837), and the insurgents fled to Navy Island in the Niagara, where they were joined by about 500 Americans. The island was bombarded by Canadian royalists, and as a result of this and the strong opposition of General Scott of the United States army, the insurgents broke camp and Mackenzie was imprisoned for a year in Rochester jail. Later he was a journalist in the United States, in 1849 took advantage of the amnesty to return to Canada, was there a member of parliament in 1850–8, and at Toronto published the weekly 'Mackenzie's Messenger' from 1858 until shortly before his death. The reforms for which he so persistently contended have since been achieved. He wrote: 'Sketches of Canada and the United States' (1833). Consult the 'Life' by Lindsey (1862); Dent, 'Story of the Upper Canadian Rebellion' (1885); Read, 'The Canadian Rebellion of 1837' (1896).

Mackenzie, Canada, a district in the Northwest Territories, bounded north by the Arctic Ocean, east by Keewatin, south by Athabasca, and separated on the west from Yukon, by the northernmost spur of the Rocky Mountains. The district created in 1895 and administered by the government of the Northwest Territories, is the largest in Canada, having an estimated area of 563,200 square miles, of which 82,000 square miles are water. The surface generally is diversified; in the northwest it is a sterile waste; along the river valleys and on the western mountain slopes it is well forested with fir, pine, spruce, and other northern trees, while coal and other minerals, although unexploited, are found. The chief rivers are the Mackenzie, the Coppermine, and the Great Fish or Black River (qq.v.). The soil is comparatively unproductive, the climate being arctic and inhospitable except for the few summer months. The population about 5,400, inhabit the trading settlements of the Hudson's Bay Company, along the Mackenzie and its tributaries. The pelts of the fur-bearing animals of the region are practically the only developed item of commerce.

Mackenzie River, Canada, a large river in the Northwest Territories, which flows from the Great Slave Lake, and after a northwesterly course of about 1,000 miles, enters the Arctic Ocean by numerous mouths at the island-studded Mackenzie Bay. Its tributary head-streams are the Great Peace River, which rises in British Columbia beyond the Rocky Mountains, and the Athabasca or Elk River, which has its source in the Rockies; these two rivers flowing into Lake Athabasca are discharged by the Great Slave River into Great Slave Lake, whence issues the Mackenzie. The principal affluent of the Mackenzie is the Liard or Mountain River. With the exception of a slight obstruction in the rapids near Fort Good Hope, in lat. 66° N., the Mackenzie and its tributaries are navigable for a distance of over 1,800 miles, and from June to October steamboats of the Hudson's Bay Company ply from Great Slave Lake almost to the Arctic Ocean. Forts Providence, Norman, and Good Hope are trading stations along its banks, while Forts McPherson, Franklin, Enterprise, Reliance, Resolution, Chippewyan, Nelson, and Graham are along its tributaries. The valley is well-wooded with spruce, pine, poplar, and birch, while coal, salt and other minerals abound in the region. The river is named after Alexander Mackenzie (q.v.), who first explored it in 1789.

Mackerel, măk'ĕ-rĕl. The common mackerel (*Scomber scombrus*) is the best known and most important member of the family *Scombridæ* and one of the most valuable of food-fishes, ranking in this respect behind the cod and herrings only. The mackerel is a compactly built fish of smooth and regular outline, the fusiform figure tapering accurately to the pointed snout, so that it cleaves the water easily. The large, deeply-forked tail is supported on a slender peduncle, provided with two small keels on each side, and preceded by a dorsal and a ventral series of finlets of five each. A soft dorsal and a counterpart anal fin are placed exactly opposite each other and behind the level of the vent, and the anterior dorsal fin is supported by usually 11 delicate spines. Very numerous and small scales cover the body nearly uniformly, but are absent from the head. The large mouth is provided with numerous small sharp teeth. The gill-rakers are long and the air-bladder is wanting. The color of the back is deep blue, marked by about 35 nearly vertical wavy black lines; below, the fish is silvery white. A recent close study of the species on the European side of the Atlantic establishes the existence there of local races, as in the herring, but it appears that the American representatives, while constituting a race distinct from the European, are more homogeneous.

The mackerel is an abundant fish on both sides of the North Atlantic, on the American side ranging from Cape Hatteras to the Straits of Belle Isle, and on the European from northern Norway to the Canary Islands and throughout the Mediterranean. While a true pelagic fish of wandering and migratory habits and, like most such, capricious in its movements, the great body of mackerel approaches the American coast and moves along it northward as the temperature of the water rises to about 45° F. On the approach of winter they retire to a greater distance from the land, but a few remain throughout the year near the coast. Mackerel swim in great schools at or near the surface; one such covering an area of 10 square miles, and another estimated as containing 1,000,000 barrels, have been observed. The local movements of the schools are largely regulated by the food-supply, which consists of small pelagic fishes, various kinds of small crustaceans, etc., which are pursued with great eagerness. On the other hand, the bluefish and other carnivorous fishes, porpoises, squids and fish-eating birds, are relentless enemies. Spawning takes place in the open sea, not far from the coast, from Vineyard Sound to the Gulf of St. Lawrence, and during the months of May, June and early July. The eggs are about one millimetre in diameter, contain an oil-drop and float at the surface, where the young fish develop and live. They grow rapidly and are about five inches long by the end of the first half year, when they are known as “spikes”; “blinkers” are about one year old and six or seven inches long; “tinkers” are seven to nine inches long and are supposed to be two years old. At the age of three or four years the mackerel is mature and from 12 to 18 inches long. The very largest specimens weigh about four pounds and have a length of 22 to 23 inches.

The mackerel fishery is of the greatest importance in the New England States and Nova Scotia, and in Norway, Ireland and Great Britain. In Europe the fishery is prosecuted almost exclusively by means of small boats and hand lines, but in America is chiefly carried on in staunch sea-going schooners, most of which hail from Gloucester, Mass., and which are equipped with purse-seines, by means of which entire schools are surrounded and captured. The fishing begins off Cape Hatteras in March or April and the schools are followed northward as they appear successively on the New Jersey, New England and Canadian coasts. In addition to the operations of this mackerel fleet, local fisheries are carried on along much of the coast with pound-nets, gill-nets and hand-lines. The spring and local catches are generally sold fresh, the summer catch being split and salted. The product of the fishery has been peculiarly subject to fluctuations, due in large part to alternating periods of abundance and scarcity of the fish. Colonial writers refer to its great plenty, and statistics of the catch inspected in Massachusetts show a somewhat regular recurrence of such periods at intervals of about 20 years. From 350,000 barrels in 1880 and 395,000 in 1881, the catch has steadily declined to 75,000 in 1886, and 18,000 in 1891, since which time it has sometimes been larger, sometimes smaller, but an abundance of young fish and other signs may indicate the approach of another period of plenty. The number of vessels employed in 1903 was about 250, or less than one fourth what it formerly was. In 1901 the total value of the mackerel, both fresh and salted, landed at Gloucester and Boston, was $713,100.

An elaborate account of the American mackerel fishery will be found in Brown-Goode's ‘Materials for a History of the Mackerel Fishery,’ Report U. S. Fish Com. (1884); for some recent views see Moore, ‘Report National Fishery Congress’ (Washington, 1898); and for methods of preservation, Stevenson, ‘The Preservation of Fishery Products for Food,’ Bull. U. S. Fish Com. (1898).

Mackerel Shark, or **Porbeagle,** a shark of the family *Lamnidæ,* allied to the man-eater (q.v.), and like it sometimes called blue shark, on account of its color, which is frequently seen on both sides of the northern Atlantic Ocean; it is the *Lamna cornubica* of ichthyologists. The ordinary length is about 10 feet, and they become very abundant in summer, when the mackerel are running, along the New England coast, and also about Great Britain, where they are called porbeagles. They are a nuisance to fishermen by destroying their nets, through which several will often tear their way (for they roam about in bands) in pursuit of captured fish. Formerly considerable quantities of oil were saved from their livers, but at present the value of this commodity does not pay for the trouble of taking them.

Mack'ey, Albert Gallatin, American writer on Freemasonry: b. Charleston, S. C., 12 March 1807; d. Fortress Monroe, Va., 20 June 1881. He was graduated from the Medical College of South Carolina in 1832 and was demonstrator of anatomy there in 1838, but after 1844 devoted himself to studies of Freemasonry and became a standard authority on the subject. Among his works are: ‘A Lexicon of Freemasonry’ (1845); ‘The Mystic Tie’ (1849); ‘Book of the Chapter’ (1858); ‘A Manual of the Lodge’ (1862); ‘A Text-Book of Masonic Jurisprudence’ (1869); ‘Encyclopædia of Freemasonry’ (1874).

McKibben, ma-kĭb'ĭn, **Chambers,** American soldier: b. Pittsburg, Pa., 2 Nov. 1841. He enlisted as a private in the volunteer service 22 Sept. 1862, was brevetted captain for gallant services in the battle of North Anna River (Va.) and in the operations on the Weldon railway, and on 1 May 1896 attained the rank of lieutenant-colonel of the 21st United States infantry. At the beginning of the war with Spain he went to Cuba with Shafter's army, fought at Santiago (1 July 1898), and was made brigadier-general of volunteers and appointed military governor of Santiago. On 12 May 1899 he was mustered out of the volunteer service, and on 6 June 1899 assumed command of the department of Texas with rank of colonel of infantry (commissioned colonel 12th United States infantry 1 April 1899).

Mackie, Pauline Bradford. See Hopkins, Pauline Bradford.

McKim, ma-kĭm', **Charles Follen,** American architect: b. Chester County, Pa., 24 Aug. 1847; d. 14 Sept. 1909. He studied at the Lawrence Scientific School in 1866, at the Beaux-Arts of Paris in 1867–70, and shortly afterward entered into partnership with Stanford White and William R. Meade. This firm achieved some of the finest triumphs of recent American architecture. Among notable examples of its work are the buildings of Columbia University, and the Public Library of Boston. In 1903 McKim received the royal gold medal from the Royal Institute of British Architects in recognition of his services to architecture. He was the second American to obtain this honor, R. M. Hunt (q.v.) having been the first. On the occasion of the presentation he made an able speech reviewing the progress of his profession in the United States. He was elected president of the American Institute of Architects.

McKim, James Miller, American abolitionist: b. near Carlisle, Pa., 14 Nov. 1810; d. Llewellyn Park, West Orange, N. J., 13 June 1874. He was graduated from Dickinson College (Carlisle, Pa.) in 1828, studied medicine at the University of Pennsylvania and theology at Princeton (1831) and Andover (1832), and in 1835 was ordained a Presbyterian pastor in Womelsdorf, Pa. An original member of the American Anti-Slavery Society, he became its lecturing agent in October 1836, and spoke throughout Pennsylvania, often at great personal danger. In 1840 he removed to Philadelphia, where he was publishing agent of the Pennsylvania Anti-Slavery Society and later corresponding secretary until 1862. In November 1862 he called a public meeting in Philadelphia to provide for 10,000 slaves suddenly liberated by the capture of Port Royal, S. C. As a result, the Philadelphia Port Royal relief committee was formed. This committee was expanded in November 1863 into the Pennsylvania Freedman's Relief Association, of which McKim became the corresponding secretary. In that capacity he was active in the establishment of negro schools in the South. In 1865–9 he was corresponding secretary of the American Freedman's Commission, which on his motion was disbanded in July 1869. In 1865 he assisted in founding and became a proprietor of the New York weekly ‘Nation.’ During the Civil War he was an advocate of the enlistment of negro troops, and as a member of the Union League of Philadelphia assisted in the recruiting of 11 colored regiments.

Mackinac (măk'ĭ-năk or măk'ĭ-nâ) **Island,** Mich., in Mackinac County, at the entrance to Straits of Mackinac, in the northwest part of Lake Huron; about 255 miles north by west of Detroit. The island is about three miles long and two wide. It is rocky, and covered with trees, shrubs, and flowers. The island has been prominent since the early missionaries and explorers mentioned it in connection with its command of the channel entering the Straits. The city of Mackinac on the southeast shore was chartered in 1900. Pop. of the city (1900) 665.

Mackinder, Halford John, English author and educator: b. Gainsborough, 15 Feb. 1861. He was educated at Epsom College, Christ Church, Oxford; in 1883 was president of the Oxford Union Society; Burdett Coutts University Scholar 1884; barrister, Inner Temple 1886; Reader in Geography Oxford University 1887–1905; and since 1903 has been a Senator of London University and Director of the London School of Economics and Political Science. He was president of the Geographical Section, British Association 1895; leader of the Mount Kenya Expedition 1899; contested Warwick (Liberal) 1900; Officer de l'Instruction Publique de France 1901; corresponding member Berlin Geographical Society 1903; and medallist Royal Scottish Geographical Society 1903. He has written: (with Sadler) 'University Extension, Past, Present and Future' (1891); 'Britain and the British Seas' (1902); etc.

McKinley, mą-kĭn'lĭ, **William,** American statesman, 25th President of the United States: b. Niles, Trumbull County, Ohio, 29 Jan. 1843; d. Buffalo, N. Y., 14 Sept. 1901. He was educated at Union Seminary, Poland, Mahoning County, Ohio, and Allegheny College (Meadville, Pa.) (1860–1), was forced by illness to discontinue his college course, taught in the public schools, was a clerk in the Poland post-office, and on 11 June 1861 enlisted for the Civil War as a private in company E of the 23d Ohio volunteer infantry. His first battle was that of Carnifex Ferry (10 Sept. 1861), and on 15 April 1862, while in camp at Fayetteville, western Virginia, he was promoted commissary sergeant. For conspicuous service at Antietam (17 Sept. 1862) he was made 2d lieutenant of company D. His subsequent appointments were, 1st lieutenant company E (7 Feb. 1863), captain company G (25 July 1864), and brevet major (14 March 1865). When mustered out on 26 July 1865 he was acting assistant adjutant-general on the staff of General S. C. Carroll, commanding the veteran reserve-corps stationed at Washington. Among other actions in which he participated were those of South Mountain (14 Sept. 1862), Lexington (10 June 1864), Kernstown (24 July 1864), Opequan Creek (Winchester) (19 Sept. 1864), Fisher's Hill (22 Sept. 1864), and Cedar Creek (19 Oct. 1864). During his subsequent political career he was generally known, especially in Ohio, as Major McKinley. At the close of the war he began the study of law at Youngstown, Ohio (1865–6), continued it at the Albany (N. Y.) law school (1866–7), in March 1867 was admitted to the bar at Warren, Trumbull County, Ohio, and at once entered practice at Canton. In 1870–1 he was prosecuting attorney of Stark County, and during the campaign between R. B. Hayes and William Allen for the governorship of the State, spoke effectively against the «greenback» craze. He was elected to Congress as Republican representative from the 17th Ohio district in 1877, and served continuously in the 45th, 46th and 47th Congresses (1877–83). It was asserted by the Republicans that he was elected in 1882 to the 48th Congress by a majority of eight ballots; but, although he had received the certificate of election, his seat was successfully contested by J. H. Wallace, who was not, however, seated until June 1884. He represented the 20th district in the 49th Congress (1885–7), and the 18th in the 50th and 51st Congresses; but in 1890 was defeated in the 16th for the 52d Congress by 300 ballots by J. G. Warwick, Democrat, lieutenant-governor of the State a short time previously. His defeat was attributed to the gerrymandering of the district by a Democratic legislature. His service in Congress was notable. In 1877 he was appointed a member of the judiciary committee, and in December 1880 of the ways and means committee to succeed James A. Garfield; and in 1881 was chairman of the committee in charge of the Garfield memorial exercises in the House. In 1889–90 he was chairman of the ways and means committee. He was a candidate for speaker of the 51st Congress, but was defeated by T. B. Reed on the third ballot in the Republican caucus. He was known among the foremost orators of the House; and his speeches on arbitration as a solution of labor troubles (2 April 1886) and in support of the civil-service laws (24 April 1890) were most favorably received. But his principal efforts were made in connection with the tariff, which, from his first appearance in the House, was the chief object of his study. On 6 April 1882 he spoke in advocacy of protection; on 30 April 1884 in opposition to the Morrison tariff bill, making what was esteemed the ablest argument against that measure; and on 7 May 1890 in support of the general tariff bill, now known by his name, which, as chairman of the ways and means committee, he had introduced before the House on 16 April. The bill was passed by the House on 21 May, by the Senate on 11 September, and on 6 October became a law. His bill obtained for him an international reputation, and eventually the presidency. In 1884 he was delegate-at-large from Ohio to the Republican national convention at Chicago, where he supported Blaine's candidacy, and where, as chairman of the committee on resolutions, he helped to determine the platform of his party, which he read before the convention. In the Republican national convention at Chicago in 1888, he was again a delegate and chairman of the committee on resolutions. He supported the candidacy of John Sherman, although, when it was finally learned that Blaine would decline the nomination, he was himself the choice of many delegates and was strongly urged to permit the use of his name. At the Minneapolis convention of 1892 he was once more a delegate and was elected permanent chairman of the assembly. He supported the renomination of President Harrison, and though refusing the use of his own name, received the ballots of 182 delegates. He then left the chair and moved to make Harrison's nomination unanimous, which was accordingly done. In the ensuing campaign he took a very active part, traveling, it was estimated, more than 16,000 miles and speaking to more than 2,000,000 voters. In 1892–6 he was governor of Ohio, having been elected in 1891 by 21,500 plurality, and in 1893 by the unusual plurality of 80,995. Labor riots occurred during his administration, necessitating the placing of 3,000 militia troops in active service, but the difficulties were successfully adjusted. McKinley also personally directed the relief work for the

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WILLIAM McKINLEY,

TWENTY-FIFTH PRESIDENT OF THE UNITED STATES.

starving miners of the Hocking Valley district. He was nominated for the presidency by the Republican national convention which met at St. Louis 16 June 1896, and was elected by a plurality of 601,854 over W. J. Bryan, receiving a popular vote of 7,104,779, and in the electoral college a vote of 271 to 176 for Bryan. Throughout the campaign he remained in Canton, where he made over 300 speeches to more than 750,000 visitors. Under his administration decided increase in business prosperity followed the passage of the Dingley tariff measure. The most important event of his term was the Spanish-American war (q.v.), which he had believed might be prevented and had done all in his power to avert. When hostilities broke out on the part of certain inhabitants of the Philippine Islands, the President appointed a commission to study the situation and report on the most suitable mode of government for the new territory. On 7 July 1898 he approved the joint resolution of Congress for the annexation of the Hawaiian Islands, and in 1898 he also selected a delegation to represent the United States in the Hague peace conference which convened in May 1899. The original Philippine commission having rendered a report (31 Jan. 1900), the President appointed a new commission, known from its head, Judge W. H. Taft, as the Taft commission, under whose direction civil government was instituted in the islands on 1 Sept. 1900. (See Philippines, *History.*) In 1900 the President stood conspicuously for justice in the settlement of the difficulties in China which marked that summer. He was renominated for the presidency by the Republican national convention which met at Philadelphia on 25 June 1900, receiving the entire vote of the 930 delegates. He was elected by a popular vote of 7,206,677 to 6,374,397 for W. J. Bryan, receiving till then, the largest popular majority ever given a candidate for the presidency. He obtained 292 electoral votes and carried 28 States. On 5 Sept. 1901 he delivered at the Pan-American Exposition, Buffalo, N. Y., an important address, summarizing at once the problems then before the nation and his policy for their solution. On 6 September, while holding a reception in the Music Hall of the Exposition, he was twice shot by Leon Czolgosz (q.v.), an anarchist. He died on 14 September; and 19 September was appointed by his successor, President Roosevelt, a day of mourning and prayer throughout the United States. Unprecedented honors were paid to McKinley's memory in foreign capitals, notably in London, where memorial services were held in Westminster Abbey and St. Paul's Cathedral. For five minutes on the day of the funeral all motive power in the United States remained still. Consult: Smith (editor), 'Speeches and Addresses of William McKinley' (1893); Porter, 'The Life of Major McKinley' (1896); and 'Speeches and Addresses of William McKinley from 1897 to 1901' (1900). See also United States, *History.*

McKinley Act, a name popularly given to a tariff bill reported to Congress, 21 May 1890, by the Ways and Means Committee of the House of Representatives, of which William McKinley was chairman. It became a law in October 1890, and was repealed in 1894. It increased the duties on wool, woolen manufactures, on tin-plate, barley, and some other agricultural products, and remitted the duty on raw sugar. The reciprocity feature was an important part of the bill, providing for the remission of duty on certain products from those countries which should remove duties on American imported products. See Tariff.

McKinley, Mount, United States, a peak of the Rocky Mountains, the highest in North America, south of the central part of Alaska; about 155 miles north of Cook Inlet. The Indian name for this peak is Traleyka, and the Russian name, Bolshaya. The fact that this is the highest land on the continent was not known till 1896 when Mr. Dickey explored the Sushitna River and the land near its source. He estimated the height of the peak at 20,000 feet, and named it McKinley, in honor of William McKinley (q.v.). In 1903 it was visited by members of the United States Geological Survey. The mountain is a great dome-shaped mass, over 20,000 feet above the sea.

McKinney, mạ-kĭn'ĭ, Texas, city, county-seat of Collin County, on the Missouri, K. & T. and the Houston & T. C. R.R.'s; about 30 miles north by east of Dallas. It is situated in a rich agricultural region, in which cotton is cultivated quite extensively. The chief industrial establishments are cottonseed-oil mills, cotton gins, cotton compresses, wagon and carriage shops, and flour mills. It is the seat of the McKinney Collegiate Institute. The court-house is a fine building and cost $100,000. The waterworks are owned and operated by the city. Pop. (1910) 4,714.

Mackintosh, măk'ĭn-tŏsh, Sir **James**, Scottish historian and philosophical writer: b. Aldourie, Aberdeenshire, 24 Oct. 1765; d. London 30 May 1832. He was educated at Aberdeen and Edinburgh; studied medicine and took the M.D. degree in 1787; published his 'Vindiciæ Gallicæ' in answer to Burke's 'Reflections on the French Revolution'; quitted the medical profession and was called to the English bar in 1795. By reason of his brilliant lectures on the 'Law of Nature and Nations,' and his defense of Peltier, who was prosecuted for a libel on Napoleon Bonaparte, he acquired fame at the bar, was knighted, and in 1804 appointed recorder of Bombay. After an honorable career in India he returned to England; entered Parliament for Nairn, and afterward for Naresborough; was professor of law at Haileybury College (1818–24), a member of privy council, and in 1830 commissioner of Indian affairs. Among his writings may be mentioned his 'History of England,' a fragment extending only to the reign of Elizabeth; 'Dissertation on the Progress of Ethical Philosophy' in the Encyclopædia Britannica; a 'Life of Sir Thomas More' in Lardner's Cyclopædia; and nine chapters of an unfinished work on the revolution of 1688.

Mackintosh, a water-proof overcoat, or outer garment, one of the products of modern rubber manufacture. It derives its name from the inventor. See India Rubber.

Macklin, măk'lĭn, **Charles**, Irish actor and dramatist: b. Ireland 1 May 1697; d. London 11 July 1797. He was the son of an Irish gentleman named McLaughlin and in 1733 appeared in minor parts at Drury Lane, London. He steadily rose in public favor, till 1741 he appeared in his greatest role, Shylock. He was accounted from this period among the best actors of the time. His last performance was at Covent Garden in May 1789, at past the age of 90. In 1735 he accidentally killed a brother actor in a quarrel and was tried for murder; and was frequently afterward engaged in disputes and actions at law. Of his own plays only 'The Trueborn Irishman'; 'Love a-la-Mode' (1759); and 'The Man of the World' (1781) have been printed. Consult 'Life' by Parry (1891).

Maclagan, William Dalrymple, English archbishop: b. Edinburgh 1826. He was educated at Edinburgh and was graduated in mathematical honors at Cambridge University. He served in the Indian army (1847–52); was ordained deacon (1856) and priest (1857). He was appointed bishop of Lichfield (1878) and archbishop of York in 1891. He has published 'Pastoral Letters and Synodal Classes' (1891).

McLane, măk-lăn', **Allan,** American soldier and jurist: b. 8 Aug. 1746; d. Wilmington, Del., 22 May 1829. In 1774 he settled in Kent County, Del., and in the Revolution he took a prominent part. He became a lieutenant in Thomas Rodney's regiment of Delaware militia, attained colonel's rank, and at the close of the war was appointed judge of the Delaware court of appeals. In 1790–8 he was United States marshal of Delaware under Washington's appointment, and from 1808 until his death, collector of Wilmington (Del.) port. He also served in the Delaware legislature, being for a time speaker of the lower house.

McLane, Louis, American statesman: b. Smyrna, Kent County, Del., 28 May 1786; d. Baltimore 7 Oct. 1857. He was the son of Allan McLane (q.v.), and entered the navy at an early age, served as a midshipman under the elder Decatur. Quitting the navy in 1801 he studied law, was admitted to the bar in 1808, and rose to eminence in the profession. He represented Delaware in Congress, 1816–27, when he was chosen United States senator. In 1829–31 he was minister to Great Britain, and on his return home was made secretary of the treasury. In 1833 he declined to sanction the removal of the deposits from the United States bank, and was consequently transferred by the President to the State Department. He held the office of secretary of state till June 1834, when he resigned and retired from political life. In 1837 he accepted the presidency of the Baltimore & Ohio Railroad, which he held till 1847. In June 1845 he was appointed by President Polk ambassador to London during the Oregon negotiations, after the settlement of which he resigned. In 1850 he was a member of the convention to reform the constitution of Maryland.

McLane, Robert Milligan, American politician and diplomat: b. Wilmington, Del., 23 June 1815; d. Paris, France, 16 April 1898. He studied at the Collège Bourbon of Paris (1829–31), was graduated from West Point in 1837, took active part in the Seminole War in Florida (1837), and served under Gen. Scott in the Cherokee country (Georgia). He resigned from the army in 1843, and having already been admitted to the bar in the District of Columbia, began practice at Baltimore, Md. In 1847–51 he was a Democratic member of the House of Representatives in the 30th and 31st Congresses. In 1853 he was appointed commissioner, with powers of minister plenipotentiary, to China, Japan, Siam, Korea, and Cochin China; and from this mission he returned in 1856, having with Commodore Perry concluded important treaties. In 1859–61 he was minister to Mexico, in which capacity he signed the treaty of 1860. In 1861 he returned to Baltimore and there took a prominent part in the discussions attending the secession of the cotton States. He was one of the committee appointed by the Maryland legislature (May 1861) to confer with Lincoln in regard to alleged unconstitutional proceedings on the part of the Federal government within the State of Maryland. Upon the decision of the State legislature, based on the committee's report, that it was inexpedient for Maryland to secede, McLane retired from public affairs for a time. In 1877–8 he was State senator; in 1879–83 a representative in the 46th and 47th Congresses; and in 1883–5 governor of Maryland. He was minister to France in 1885–9 by appointment of President Cleveland.

Maclaren, mạ-klăr'ĕn, **Ian.** See Watson, John.

McLaren, William Edward, American bishop: b. Geneva, Ontario County, N. Y., 15 Dec. 1831; d. New York, 19 Feb. 1905. He was graduated at Jefferson College, 1851, ordained to the Presbyterian ministry, 1860, and entered that of the Protestant Episcopal Church in 1872. Three years later he was appointed bishop of Illinois; after the subsequent division of the diocese became bishop of Chicago. Among his writings may be mentioned 'Catholic Dogma the Antidote of Doubt' (1884).

McLaughlin, măk-lâk'lĭn, **Andrew Cunningham,** American historical writer: b. Beardstown, Ill., 14 Feb. 1861. He graduated from the University of Michigan in 1882, from its law school in 1885, was professor of history there 1891–1906 and since 1906 at the University of Chicago. He was director of the bureau of historical research of Carnegie Institution, Washington, D. C., 1903–5, and managing editor of the 'American Historical Review,' 1901–5. He has written 'Lewis Cass' in 'American Statesmen' series (1891); 'History of Higher Education in Michigan'; 'Civil Government in Michigan' (1892); 'History of the American Nation' (1899); 'The Confederation and the Constitution' (1905); and (with Van Tyne) 'History of United States for Schools' (1911).

McLaughlin, Mary Louise, American artist: b. Cincinnati. She began to decorate pottery in 1877 and made Losanti porcelain (1898), exhibiting for the first time in the Paris Exposition of 1900. She has been awarded several public honors for her work. Among her published writings are: 'China Painting'; 'Pottery Decoration'; 'Suggestions to China Painters'; 'Painting in Oil'; 'The Second Madame.'

Maclaurin, măk-lâ'rĭn, **Colin,** Scottish mathematician and philosopher: b. Kilmodan, Argyleshire, February 1698; d. 14 June 1746. He was educated at Glasgow University, and in 1717 became professor of mathematics in Marischal College, Aberdeen, and two years after was chosen fellow of the Royal Society. In 1720 he published 'Geometrica Organica,' a work on curves. In 1725 he was elected professor of mathematics at Edinburgh, where his lectures contributed much to raise the character of that university as a school of science. A controversy with Bishop Berkeley led to the publication of Maclaurin's great 'Treatise on Fluxions' (1742). He also wrote a 'Treatise on Algebra'; 'Account of Sir Isaac Newton's Philosophical Discoveries'; etc.

MacLaws, măk-lâz′, **Lafayette,** American military officer: b. Augusta, Ga., 15 Jan. 1821; d. Savannah, Ga., 24 July 1897. He was graduated at West Point in 1842; served in the Mexican War till the surrender of Vera Cruz; and at the beginning of the Civil War was commissioned a brigadier-general in the Confederate army. He was promoted major-general 23 May 1862, and during the march of Sherman to the sea commanded the defenses of Savannah and had charge of the Military District of Georgia. He was appointed collector of internal revenue at Savannah in 1875 and postmaster there in 1876.

Maclay, mạ-klā′, **Edgar Stanton,** American author: b. Foochow, China, 18 April 1863. He was graduated at Syracuse University in 1885; was reporter on the Brooklyn *Times,* 1886–90, and on the New York *Tribune,* 1891–3; served on the editorial staff of the *Tribune,* 1893–5, and on that of the New York *Sun,* 1895–6. In 1896 he was appointed lighthouse-keeper at Old Field Point, and in 1901 received an appointment at the New York Navy-Yard. He edited the 'Journal' of William Maclay (q.v.), and is the author of a 'History of the United States Navy,' which occasioned much controversy and brought about his dismissal from government employ, by order of President Roosevelt, in 1901. The ground of this action, following Maclay's refusal of an official request for his resignation, was a passage in the 'History' stigmatizing Rear-Admiral Schley as a "caitiff, poltroon, and coward" for his conduct in the naval fight off Santiago, Cuba, 3 July 1898. Maclay has also written 'Reminiscences of the Old Navy' and 'The History of American Privateers.'

Maclay, William, American soldier and politician: b. New Garden, Chester County, Pa., 1737; d. 1804. He was educated in his native place; was a lieutenant in the French and Indian War, taking part in the expedition against Fort Duquesne in 1758, and afterward serving under Gen. Bouquet. He studied law, was admitted to the bar, went to England on behalf of militia officers serving in the French and Indian War, to confer upon their claims for land-grants with the proprietors of Pennsylvania, and on his return became attorney to the Penn family. In the Revolution he raised troops and equipped them, was assistant commissary of purchase, and performed some field service. In 1781 he was elected to the Pennsylvania Assembly, afterward held other offices in the State, and with Robert Morris (q.v.) was elected to the United States Senate, they being Pennsylvania's first representatives in that body. His service there ended in 1791, but in the Senate he had shown deep-seated hostility to Washington and his administration, which was the chief distinction of Maclay's senatorial career. In his later years he was a member of the Pennsylvania legislature and his last public office was that of a county judge. Consult his 'Journal,' edited by Edgar Stanton Maclay (q.v.).

Macle, măk'l, in mineralogy, a variety of andalusite, occurring in long, tapering crystals in clay-slate. They have the axes and angles of a different color from the rest of the crystals, owing to a regular arrangement of impurities in the interior.

MacLean, George Edwin, American educator: b. Rockville, Conn., 31 Aug. 1850. He was graduated at Williams College in 1871 and at Yale Theological Seminary in 1874; from 1877 to 1881 was pastor at Troy, N. Y.; studied in Germany; and in 1883 became professor of English language and literature at the University of Minnesota. He was chancellor of the University of Nebraska, 1895–9, and since 1899 has been president of the University of Iowa. His writings include: 'A Chart of English Literature' (1892); 'Old and Middle English Reader' (1893); and 'A Decade of Development in American State Universities' (1898). He has edited: 'Ælfric's Anglo-Saxon Version of Alcuini Interrogationes Sigewulfi Presbyteri in Genesin' (1883); 'An Introductory Course in Old English,' by Wilkin and Babcock (1888); and 'An Old and Middle English Reader' by Zupitza (1889).

McLean, George P., American lawyer and politician: b. Simsbury, Conn., 7 Oct. 1857. He was for a time a reporter on the Hartford *Evening Post,* then studied law, and was admitted to the bar in 1881, and immediately commenced practice in Hartford. In 1883–4 he was a member of the General Assembly, where he soon became distinguished for facility in debate and was considered one of the leaders of the Republican party. In 1888 he was elected State senator, and in 1900 nominated by his party as governor of Connecticut and elected. Though he was not widely known at the time of his election, his independent position in regard to constitutional reform soon made him prominent; both in his first governor's message and before the constitutional convention, he advocated representation in the legislature according to population instead of by towns. Though in this he opposed certain elements in his own party, he gained support from a considerable number of Democrats and great personal popularity in the cities. In 1902 he was offered renomination, but declined, in 1903–4 he was a prominent candidate for United States Senator.

MacLean, John, American jurist and statesman: b. Morris County, N. J., 11 March 1785; d. 4 April 1861. He removed with his parents to Warren County, Ohio, in 1799, later went to Cincinnati, where he studied law, and was admitted to the bar in 1807, and commenced practice at Lebanon, Warren County, Ohio. He was a member of Congress 1812–16, and from 1816–22 judge of the supreme court of Ohio. In July 1823 he was appointed postmaster-general, the Post-office Department being then in a very disordered and inefficient condition. Under his administration this branch of the public service was restored to order, and managed with a vigor, method, and economy that soon secured an almost unexampled degree of applause and public confidence. In 1829 he became associate justice of the Supreme Court of the United States. In this capacity his charges to grand juries while on circuit are distinguished for ability and eloquence. In the Dred Scott case he dissented from the decision of the court as given by Chief Justice Taney, and expressed the opinion that slavery has its origin merely in power, and is against right, and in this country is sustained only by local law.

McLean, John, American educator: b. Princeton, N. J., 1800; d. there 1886. His whole life was spent in Princeton. He was graduated from the college there in 1816, became tutor in the institution in 1818, and was a member of the faculty till 1868, when he resigned the presidency, which he had held from 1854. He published ‹Lecture on a Common School System for New Jersey› (1829), which in later years had much influence in the establishment of such a system; ‹History of the College of New Jersey› (1877); etc.

McLean, Sarah Pratt. See GREENE, S. P. M.

McLean, Simon James, American sociologist: b. Brooklyn, N. Y., 14 June 1871. He graduated from the University of Toronto in 1894, was professor of economics and sociology in the University of Arkansas 1897–1902, associate professor of economics in Leland Stanford 1902–6, since 1906 associate professor of political economy, Univ. of Toronto.

McLellan, mӑk-lĕl'ạn, **Isaac,** American poet: b. Portland, Maine, 21 May 1806; d. Greenport, L. I., 20 Aug. 1899. He was graduated at Bowdoin College, practised law for several years in Boston, Mass., and in 1851 removed to New York and gave his whole attention to literature and field sports. His liking for the latter was so strong indeed, and his poems on these themes so numerous, that he gained the title of «the poet-sportsman.» Some of his early poems, such as ‹The Death of Napoleon› and ‹New England's Dead,› attracted much attention. He was the author of ‹The Fall of the Indian› (1830); ‹Mount Auburn› (1843); and ‹Poems of the Rod and Gun› (1886).

McLemore's Cove, Ga., Military Operations at. While there was little fighting in the cove, the operations there in September 1863 were vital to the success of Gen. Rosecrans' campaign for Chattanooga. The failure of Gen. Bragg's excellent combinations immediately increased the difficulty of interposing his army between the Union army and Chattanooga and, in the end, made it impossible.

Lookout Mountain bounds the cove on the west. Following its eastern base from Chattanooga southward, it is 24 miles to Stevens' Gap, over which the Fourteenth corps, Gen. Thomas', which constituted the centre of Rosecrans' army, crossed Lookout from the west into the cove. Eight miles beyond is Dougherty's Gap, from which point Pigeon Mountain, running northeastwardly, forms the eastern boundary of the cove. The triangular area thus enclosed is from five to eight miles wide, the mouth opening toward Chattanooga, and contains from 80 to 100 square miles. Gen. Bragg, in evacuating Chattanooga, because of Rosecrans' flank movement, had conducted his army by way of Rossville and Lee and Gordon's Mill and established it behind Pigeon Mountain, from a point near Lee and Gordon's to Lafayette, 13 miles beyond. From this position of his army there were four gaps through which roads led into McLemore's Cove. Opposite Lafayette was Dug Gap, to the south of it Blue Bird, and to the north Cattlett's and Wrothen's. Dug Gap was directly opposite Stevens' Gap. The Chickamauga Creek rises near Dougherty's Gap and runs northward through the cove.

The right of the Union army, A. McD. McCook's Twentieth corps, with the cavalry corps, Gen. D. S. Stanley, crossed Lookout at Valley Head, 42 miles south of Chattanooga, and descended south of Dougherty's Gap. The left of this army, Crittenden's Twenty-first corps, had crossed the north point of Lookout near Chattanooga and, leaving one brigade in that city, had advanced to the vicinity of Lee and Gordon's Mill. It there formed the left of the Union army. The centre corps was at Stevens' Gap, 15 miles distant, the right corps about 25 miles beyond that point, with the cavalry still farther south. This separation of Rosecrans' army was made necessary by the fact that there were no roads practicable for wheels crossing Lookout Mountain in closer proximity.

Gen. Bragg was fully informed of the movements, and the isolation of the several Union corps. These movements, which placed each corps beyond supporting distance from either of the others, were immediately rendered still more precarious by reports received from Gen. Sheridan on the extreme right that the enemy was retreating toward Rome, which led Gen. Rosecrans to order pursuit. Gen. Thomas urged active concentrations instead, but was overruled.

Gen. Bragg, from his position behind Pigeon Mountain, commanding the four gaps opening directly upon the advance of the centre across the cove, was in most favorable position for first striking Gen. Thomas with effect, and then turning upon either of the wings before they could attain supporting distance. Had Bragg's orders been promptly and vigorously executed the situation of the Union army would have been critical.

The night of the 9th, Negley's division, forming the Union advance from Stevens' Gap along the road leading through Dug Gap to Lafayette, encountered the enemy in the gap, and later in the night it was ascertained that a strong force was concentrating there.

Gen. Bragg, in developing his plan, had advanced Hindman's division from the Lafayette side of the mountain, and ordered Gen. Hill to send Cleburne to co-operate. Late at night Hill sent word that Cleburne was sick, the gaps blocked with felled trees, and that the movement was, therefore, impracticable.

Early the next morning Gen. Buckner from the extreme right was ordered to advance into the cove to support Hindman. This junction was not effected until the afternoon of the 10th. Meantime, Negley had withdrawn his division from Dug Gap and was maneuvering in defense. Hindman, instead of attacking as ordered, sent a staff-officer to Bragg at Lafayette to suggest a change of plan. This officer reached Bragg at midnight and was at once directed to return and notify Hindman to carry out the orders he had received. Cleburne was then in Dug Gap, and had promptly cleared away obstructions. Walker's reserve corps was ordered forward to join Cleburne in the attack, and all impatiently waited for Hindman's guns. Bragg had ordered seven divisions to co-operate in this movement against Thomas' three which composed the Union centre. Hindman did not attack until afternoon. At that time Baird's division had arrived from Stevens' Gap to support Negley, and by brilliant movements in retreat, with some sharp fighting by T. R. Stanley's and Starkweather's brigades, the two divisions with their trains were withdrawn in perfect order to Bailey's crossroads, a strong strategic position in front of Stevens' Gap, where Brannan's division, which had completed the crossing of Lookout, was within easy supporting distance. Thus Bragg's attempt to crush the Union centre failed. For this failure he held Hill and Hindman responsible.

Bragg then withdrew the forces operating against the Union centre to Lafayette, and at once despatched Polk's and Walker's corps with orders to attack Crittenden's corps in the vicinity of Lee and Gordon's Mill. This corps at the time was known to Bragg to be divided, with one of its three divisions near Ringgold. Polk was urged to attack with the greatest promptness. He, nowever, was led to believe that a general attack on his column was about to be delivered. Instead of carrying out Bragg's orders, he therefore awaited attack and sent for the whole of Buckner's corps as reinforcements. This delay enabled Crittenden to unite his forces, cross the Chickamauga, and take a strong position on the bluffs overlooking that stream at Lee and Gordon's. Thus Bragg's attempt to crush the Union left failed, as his movement on the centre had miscarried. For this Polk was held responsible.

Meantime the Union right was withdrawing under orders to join the centre at Stevens' Gap. Rosecrans had early discovered that Bragg, instead of retreating, was concentrated for battle, and that Johnston from Mississippi and Longstreet from Virginia were about to join him. Gen. Rosecrans in his report says: «It then became a matter of life and death to effect the concentration of the army.» The flanks of the army were 40 miles apart by the nearest practicable roads, and the centre was obliged to remain near Stevens' Gap until the right corps arrived.

Gen. Bragg's third plan, for which orders were promptly given, was to move his army down the valley of the Chickamauga, cross at the bridges and fords below Lee and Gordon's Mill, sweep up the valley, attack Crittenden, the left of Rosecrans' army, drive it back on the centre, and thus, interposing between the Union army and Chattanooga, push it back into the mountains and regain that most important city. Rosecrans, however, by an undiscovered night march moved his centre and right from the cove to the left of Crittenden, and at sunrise of 19 September had interposed between Bragg and Chattanooga on the field of Chickamauga. These movements of the opposing armies brought on the battle of Chickamauga (q.v.).

H. V. BOYNTON.

McLennan, măk-lĕn'ạn, **John Ferguson,** Scottish sociologist: b. Inverness 14 Oct. 1827; d. Hayes Common, Kent, 16 June 1881. He was educated at King's College, Aberdeen, and Trinity College, Cambridge and after two years' journalism in London returned to Edinburgh, and was called to the bar in 1857. His first important publication was the article on ‘Law’ in the 8th edition of the ‘Encyclopædia Britannica’ (1857), and in 1865 he elaborated some of its speculations in ‘Primitive Marriage: an Inquiry into the Origin of the Form of Capture in Marriage Ceremonies.’ In 1876 his ‘Primitive Marriage’ was republished with ‘Kinship in Ancient Greece’ and other matter under the title of ‘Studies in Ancient History.’ An unfinished work by him, directed against Sir H. S. Maine's patriarchal theory, was completed and published in 1885 by his brother under the title of ‘The Patriarchal Theory.’ In 1896 a second series of ‘Studies in Ancient History,’ treating of the origin of exogamy, was edited by his widow and Arthur Platt. Though his views are still and probably will remain matter of controversy, the study of primitive society received a powerful impetus from his important investigations.

McLeod, măk-lē'ŏd, **Archibald Angus,** American railway official: b. Compton County, Quebec, Canada, 1848; d. 1902. Early in life he came to the United States, where he became a rodman on the docks of the Northern Pacific railway at Duluth, and in 1885 manager of the Elmira, Cortland and Northern line. He then was successively acting general manager (1886), vice-president and general manager (1887), and president (1890) of the Reading system. His consolidation of the Lehigh Valley and Jersey Central with the Reading, under Reading control, for the purpose of controlling the carrying trade of the coal fields, resulted in the Reading passing into the hands of three receivers, of whom McLeod was one.

MacLeod, măc-lowd', **Donald,** Scottish Presbyterian clergyman and author: b. Campsie, Stirlingshire, 18 March 1831. He is a brother of Norman McLeod (q.v.), whom he succeeded as editor of ‘Good Words’ in 1872. He was educated at the University of Glasgow. He held pastorates at Lauder (1858), Linlithgow (1862) and Glasgow (1869), and, like his brother, was chaplain to Queen Victoria. He published ‘Sunday Home Service’ (1885); ‘Christ and Modern Society’ (1893); etc.

Macleod, Fiona, pseudonym of William Sharp (q.v.), Scottish poet and novelist: b. Paisley 12 Sept. 1856; d. Sicily 13 Dec. 1905. A part of his youth was spent in the Hebrides and in the islands of Iona and Arran. His stories and poems have attracted great attention by reason of their freshness of treatment and originality of conception. Among his works are: ‘Pharais’ (1895), a romance; ‘The Mountain Lovers’ (1895); ‘The Sin-Eater and Other Tales’ (1895); ‘The Washer of the Ford’ (1896); ‘Green Fire’ (1896); ‘From the Hills of Dream’ (1896); ‘The Laughter of Peterkin’ (1897); ‘Through the Ivory Gate’ (1901); ‘The Silence of Amor’ (1902).

MacLeod, Norman, Scottish Presbyterian clergyman: b. Campbelltown, Argyleshire, 3 June 1812; d. Glasgow 16 June 1872. Educated at Glasgow, Edinburgh, and in Germany, he became minister first of Loudon and then of Dalkeith, when he published his first work, ‘The Earnest Student,’ and became editor of the ‘Edinburgh Christian Magazine.’ In 1851 he became minister of the Barony parish, Glasgow, where he labored with increasing popularity for the rest of his career. In 1854 he was appointed one of the queen's chaplains for Scotland and dean of the order of the Thistle. He became editor of 'Good Words' in 1860 and continued in that post till his death. In 1867 he visited India, and in 1871 published 'Peeps at the Far East.' In 1869 he was elected moderator of the General Assembly of the Church of Scotland. Consult D. MacLeod, 'Memoir of Norman MacLeod' (1872).

McLeod, Xavier Donald, American writer: b. New York 17 Nov. 1821; d. near Cincinnati, Ohio, 20 July 1865. He was graduated from Columbia and entered the Episcopal ministery in 1845. Becoming a Roman Catholic in 1852 he took priest's orders in that faith later and was professor of rhetoric in Mount Saint Mary's College. He published 'Pynnshurst' (1852); 'Life of Sir Walter Scott' (1852); 'The Blood-Stone' (1853); 'Lescure'; 'Life of Mary Queen of Scots' (1857); etc.

Maclise, Daniel, English painter: b. Cork 2 Feb. 1806; d. Cheyne Walk, Chelsea, 25 April 1870. He became a student at the Royal Academy in 1828, and began to exhibit in 1829, but it was not until 1833 that he established his reputation with his picture of 'Snap Apple Night.' Three years after he was elected an associate, and in 1840 he became a full member of the Royal Academy. Maclise was commissioned to paint for the new Houses of Parliament, and produced 'The Spirit of Chivalry'; 'The Spirit of Religion,' and the two great paintings of the 'Meeting of Wellington and Blücher after Waterloo,' and the 'Death of Nelson' (1858-64), for which patriotic paintings he refused all remuneration. Among his best known pictures are 'Merry Christmas in the Baron's Hall'; 'The Ordeal of Touch'; 'The Marriage of Strongbow and Eva'; the 'Play Scene in Hamlet'; the 'Banquet Scene in Macbeth,' etc. His sketches, book illustrations, humorous drawings, and outline portraits were very numerous. He declined the presidency of the Academy in 1866. His works show great fertility of invention, skill in composition, and excellence in drawing, but his color is coarse, and his pictures are sometimes disagreeable unless seen from a distance. Consult O'Driscoll, 'Memoir of Daniel Maclise' (1871).

Maclure, măk-lūr', **William,** American geologist: b. Ayr, Scotland, 1763; d. San Angel, near the city of Mexico, 23 March 1840. In 1796 he visited the United States, and in 1803 was in Europe as one of the commissioners to settle the claims of American citizens against France for spoliations during the revolution in that country. On returning to America he engaged with zeal in the extraordinary private undertaking of a geological survey of the whole country. Depending on his own resources and observations at a time when geology was unknown as a science, and few could appreciate his motives, he visited almost every State and Territory, crossing and recrossing the Alleghanies no fewer than 50 times. His first communication to the public was a memoir entitled 'Observations on the Geology of the United States, explanatory of a Geological Map,' read before the American Philosophical Society, 20 Jan. 1809, and published in Vol. VI. of their 'Transactions.' He still continued his explorations, and on 16 May 1817, presented another memoir to the society, published in their 'Transactions,' and also in a separate volume. The former publication was 6 years prior to that of the geological map of England prepared by William Smith, a production which gave him the title of father of English geology. To Maclure is equally due the title of father of American geology. His publications attracted much attention to the science. He now settled in Philadelphia and gave his books and collections to the Academy of Natural Sciences of which he was president from 1817 till his death. He lived in Spain, 1819-24, where he attempted to found an agricultural college, and returning in 1824 to the United States attempted to carry out a similar scheme in the New Harmony settlement in Indiana. Several distinguished naturalists from Philadelphia joined him in this enterprise, but the scheme failed. After 1828 he lived in Mexico, always, however, with the intention of returning to the United States, and with his interest in the progress of scientific education there unabated. While in Mexico he wrote 'Opinions on Various Subjects,' devoted mainly to political economy (1837).

MacMahon, măk-mā'hôn, **Ella,** English novelist. She has published 'A New Note' (1894); 'A Modern Man' (1895); 'A Pitiful Passion' (1896); 'The Touchstone of Life' (1897); 'An Honorable Estate' (1898); 'Fortune's Yellow' (1900); 'Such as Have Erred' (1902).

MacMahon, Marie Edme Patrick Maurice de, Duke of Magenta and Marshal of France: b. Sully, Saône et Loire, 13 June 1808; d. near Montargis 17 Oct. 1893. He was educated at the military college of St. Cyr; served with distinction in Algeria; became brigadier-general in 1848; received command of a division during the Crimean war, and assisted in storming the Malakoff; took part in the campaign of 1859 against Austria, and won the battle of Magenta by his prompt handling of the left wing; and after the war became governor-general of Algeria. At the outbreak of war between France and Germany (1870) MacMahon was placed in command of the First army corps, which was defeated at Weissenburg and Wörth, and finally fell back upon Châlons. Here he rallied his forces, and proceeded northeastward to relieve Bazaine, who was besieged in Metz, but he was pursued by the Germans, shut up by them in the town of Sedan, and wounded in the battle before the final surrender. After the armistice with Germany he was employed by the Versailles government in putting down the commune, and in 1873 was elected president of the republic, a position which he occupied until 1879. Consult Daudet, 'Le Maréchal de MacMahon' (1883); LaFarge. 'Histoire Complète de MacMahon, Maréchal de France, Duc de Magenta' (1898).

McMas'ter, Guy Humphrey, American poet and jurist: b. Clyde, N. Y., 3 Jan. 1829; d. Bath, Steuben County, N. Y., 13 Sept. 1887. He was educated at Hamilton College, Clinton, N. Y., studied law and became judge of Steuben County in 1864 and surrogate in 1884. At 19 he wrote 'Carmen Bellicosum,' better known as 'The Old Continentals,' published in the 'Knickerbocker Magazine' and still popular. Aside from this, his best-known poems are: 'A Dream of Thanksgiving Eve' (1864); 'The Professor's Guest Chamber' (1880); 'The Commanders' (1887).

McMaster, John Bach, American historian: b. Brooklyn 29 June 1852. He graduated from the College of the City of New York in 1872, studied civil engineering, and 1877 became instructor of civil engineering at Princeton. In 1883 he published the first volume of his 'History of the People of the United States,' and the same year was appointed professor of American history in the University of Pennsylvania. His 'History,' of which five volumes were published in 1900, has become a standard work. It covers a period reaching from the adoption of the Constitution in 1789 to the outbreak of the Civil War,— less than 100 years, but a crucial time for the shaping of the country. The account of the formative time, the day of the pioneer and the settler, engages his particular attention and receives his most careful treatment. He strives to give a picture of social rather than constitutional and political growth; and tells the story of national evolution with admirable lucidity and simplicity of style, and always with an appeal to fact precluding the danger of the subjective writing of history to fit a theory. His other works are: 'Benjamin Franklin as a Man of Letters' (1887); 'With the Fathers, Studies in American History' (1896); 'Origin, Meaning, and Application of the Monroe Doctrine' (1897); 'A School History of the United States' (1897); 'A Primary School History of the United States' (1901); 'Daniel Webster' (1902); 'Brief History of the United States' (1903).

McMaster University, Toronto, Canada, is controlled by the Baptist Convention of Ontario and Quebec. It came into existence through the gift of about $1,000,000 by the late Senator William McMaster, of Toronto, but it is really a development of educational work formerly conducted at Woodstock, Ont. In 1857, under the leadership of the Rev. R. A. Fyfe, D.D., subscribers to the funds of a projected college secured from the Canadian Parliament an act to incorporate «The Canadian Literary Institute,» to be located at Woodstock. This school aimed at co-education and provided both literary and theological courses. In 1875 it secured affiliation with the University of Toronto. In 1881, through the liberality of Mr. McMaster, the Toronto Baptist College was instituted and to it was transferred the theological department of the school at Woodstock. The latter continued its literary work, and, without change of corporation, its name was changed to Woodstock College. Toronto Baptist College was affiliated to the University of Toronto in 1885, but as the result of a further donation by Mr. McMaster it was decided to establish a university to grant degrees in the «several arts, sciences and faculties,» as well as in theology. A charter was secured from the legislature of Ontario in 1887, and all the property and rights of the two separate corporations were vested in McMaster University and placed under the authority of the Board of Governors, 16 in number (exclusive of the Chancellor), responsible to the Baptist Convention of Ontario and Quebec. The control of all that pertains to the courses of study belongs to the University Senate, a body made up of the members of the Board of Governors, a certain number representing the teaching faculties and others chosen by the graduates in arts and theology. The Senate also nominates, subject to the approval of the Governors, the Chancellor and members of the faculties. Woodstock College, now a school for young men alone, and Moulton College, for young women, are academical departments of the University. Noteworthy provisions of the act of incorporation are that McMaster University is «a Christian school of learning,» the Bible must be included in the course of study, every member of the teaching staff in theology must be a member of a regular Baptist church in Canada, and all other teachers members of some «Evangelical Christian Church.» The first class in arts was graduated in 1894. The total number of students for the year 1903-4 in the three schools of the university was 470.

McMaster, William, Canadian senator and philanthropist: b. Tyrone, Ireland, 24 Dec. 1811; d. Toronto, Canada, 22 Sept. 1887. When 22 years of age, he emigrated to Canada, and after several years' experience in a large wholesale firm in Toronto, commenced business on his own account. He was elected a member of the legislative council for the Midland division of Canada in 1862, and held this seat until he was called to the Senate by royal proclamation in 1867. He was prominently identified with many public institutions, notably as president of the Canadian Bank of Commerce, member of the senate of the University of Toronto, chairman of the Canadian board of the Great Western Railway, and became widely known by his liberal donations to educational and religious institutions, especially those of the Baptist denomination, of which sect he was a member. McMaster University, Toronto, is named in his honor.

McMichael, Morton, American journalist, politician, and orator: b. Burlington, N. J., 2 Oct. 1807; d. Philadelphia, Pa., 6 Jan. 1879. After education in the public schools, he studied law at the University of Pennsylvania, and became a member of the Philadelphia bar in 1827. The year previously he became editor of the 'Saturday Evening Post,' and as an active politician served for several years on the aldermanic bench in Philadelphia. From 1831 to 1836 he was editor-in-chief of the 'Saturday Courier,' and later was connected with the 'Saturday News,' the 'Saturday Gazette,' the 'North American,' and 'United States Gazette,' in 1847 consolidating the last two in one journal, of which he was sole proprietor from 1854 until his death. He was mayor of Philadelphia from 1866 to 1869; president of the Park Commission from its organization in 1867 until his death; and in 1873 was appointed a delegate to the fourth constitutional convention of Pennsylvania. His speeches on public occasions were renowned as models of oratory. A bronze statue was erected to his memory in Fairmount Park.

McMichael, William, American soldier and lawyer: b. Philadelphia, Pa., 4 March 1841; d. New York city, 20 April 1893. The third son of Morton McMichael, he graduated at the University of Pennsylvania in 1859, but left his law studies in April 1861, to enlist as a private when President Lincoln issued his first call for troops. He attained rapid promotion to the grade of colonel, and served under Generals Thomas, Rosecrans, and Grant. He resumed his interrupted law studies after the war and in 1865 became a member of the Philadelphia bar. During General Grant's first tenure of the Presidency he was appointed solicitor of internal revenue of the Treasury Department, but resigned the office in 1871 on his appointment as United States assistant attorney-general. In 1877 he was appointed United States district attorney for the east district of Pennsylvania, but resigned shortly after to go into private practice. President Garfield appointed him a member of the United States Board of Indian Commissioners; in 1882 he was a candidate for Congress on the Independent Republican ticket; and later became a member of the bar of New York city. Like his father, he was renowned for his oratorical gifts.

McMicken, Gilbert, Canadian official and inventor; b. in Wigtonshire, Scotland, in 1813; d. Manitoba 6 March 1890. He emigrated to Canada in his 21st year, lived for several years in the Niagara district, and was appointed to various municipal offices. Interested in telegraphy, he patented two inventions in 1847, and spanned the Niagara River with the first electric wire stretched across it. From 1857 to 1861 he was the representative from Welland County in the Canadian Legislative Assembly; and as stipendiary magistrate for Canada West during the Civil War in the United States, received high commendation from Lord Monk for the able discharge of his duties. He was commissioner of police for the Dominion, and was active in the suppression of the Fenian Raid of 1870. He was in charge of the Dominion land-office in Manitoba from its opening until his retirement in 1877, also holding the office of assistant receiver-general and other posts. From 1880–82 he was a Conservative representative for Cartier in the Dominion Parliament.

Macmil'lan, a name for many years prominently identified with English publishing interests. Most important was DANIEL MACMILLAN: b. Upper Corrie, Isle of Arran, 13 Sept. 1813; d. 27 June 1857. He took service with a Cambridge bookseller in 1833, and with Seeley, Fleet Street, London, in 1837. He set up in business in London in 1843, but soon removed to Cambridge, and by 1856 had developed a very prosperous trade. He published Hughes' 'Tom Brown's School Days' in 1857; but he was chiefly aided by educational publications and the works of Kingsley and F. D. Maurice. Associated with him from 1843 was his brother, ALEXANDER MACMILLAN, previously a schoolteacher at Nitshill, not far from Paisley. In 1863 he was made publisher to Oxford University, and in the same year removed the business to London. 'Macmillan's Magazine' made its appearance in 1859. The firm maintains a branch in New York, and publishes many university and educational works, as well as considerable fiction, by American authors.

MacMillan, Conway, American botanist: b. Hillsdale, Mich., 26 Aug. 1867. He was graduated from the University of Nebraska in 1885 and has been State botanist of Minnesota from 1891. He has published 'Twenty-two Common Insects of Nebraska'; 'The Metaspermæ of the Mississippi Valley'; 'Minnesota Plant Life'; etc.

MacMil'lan, Hugh, Scottish Presbyterian clergyman: b. Aberfeldy, Perthshire, Scotland, 17 Sept. 1833; d. 1903. At the time of his death he was minister of the Free West Church, Greenock, N. B. He has been noted as a brilliant writer and preacher, and among his published works may be mentioned: 'Bible Teachings in Nature' (1867); 'Holidays in High Lands' (1869); 'The Ministry of Nature' (1871); 'The True Vine' (1871); 'The Mystery of Grace' (1893); 'The Daisies of Nazareth' (1894); 'The Clock of Nature' (1896); several of which have been translated into German, Norwegian, Swedish, French, Italian, etc.

McMillan, James, American capitalist and Senator: b. Hamilton, Ont., 12 March 1838; d. Manchester, Mass., 1902. He entered business at Detroit, Mich., in 1855, since which he enjoyed a prosperous career as organizer of the Michigan Car Company, and general manufacturer in the railroad business. He was elected to the United States Senate as a Republican in 1889, and re-elected in 1895 and 1901. He was active in many commercial enterprises and was president of the Detroit Iron Furnace Company, which employed more than 3,000 men. He gave the city of Detroit a thoroughly equipped hospital, costing $250,000, and endowed it with $300,000; to the University of Michigan a fine Shakespearean library, and added to the college buildings McMillan Hall. He bestowed substantial benefactions on several other institutions.

McMillan, James William, American soldier: b. Clark County, western Virginia, 1826; d. 10 March 1903. At the time of his death he was a member of the board of review of the Pension Bureau. He was brevetted major-general in March 1865, commanded the 1st and 2d brigades of the Nineteenth army corps, served with Butler in the Gulf campaign, and captured the blockade runner Fox, one of the richest prizes of the Civil War.

Macmillan, John, Scottish Presbyterian clergyman: b. Minnigaff, Kirkcudbrightshire, Scotland, 1670; d. Bothwell, 1753. He played a prominent part in the religious movements of his day, being founder of the Reformed Presbyterian Church, whose adherents are often called Cameronians (q.v.) or Macmillanites.

McMillan, Thomas, American Roman Catholic priest of the Missionary Society of Saint Paul the Apostle: b. Ayr, Scotland, 13 June 1851. He is of Irish descent, and when 3 years old came with his parents to America. In 1874 he entered the Missionary Society of Saint Paul the Apostle. His chief work has been in Sunday schools. In 1886 he instituted a «reading circle» movement, which has extended over all the country. In 1889 he was largely instrumental in bringing together, at New York, a large number of editors, journalists, and authors from different parts of the United States to discuss ways and means of making the press more effective in uplifting humanity. This meeting was known as that for the promotion of the «Apostolate of the Press.» In 1892 he was made chairman of the board of studies of the Catholic Summer School of America, a position which he still holds (1903). In 1897 he was the prime mover in the organization of the «Child Study Congress» held in New York city.

Macmillanites. See Macmillan, John, and Cameronians.

McMillin, Benton, American politician: b. Monroe County, Ky., 11 Sept. 1845. He received an academic education and in 1871 engaged in law practice. In 1874 he was elected to the State legislature of Tennessee, and in 1877 was appointed special judge of the circuit court. He was elected to Congress in 1879, and served until 1899, when he was elected governor of Tennessee, and two years later was re-elected.

McMinnville, măk-mĭn'vĭl, Ore., city, county-seat of Yamhill County; on the Yamhill River, and on the Southern Pacific railroad; about 55 miles southwest of Portland. It is situated in an agricultural region, in which hops, wheat, and fruit are raised extensively. The city has considerable trade in agricultural products, live-stock, lumber, wool, and some dairy products. The electric-light plant and the waterworks are owned and operated by the city. Pop. (1910) 2,400.

McMinnville, Tenn., town, county-seat of Warren County; on the Nashville, C. & St. L. railroad; about 80 miles southeast of Nashville. It is in the midst of an agricultural region, and in the vicinity is found excellent building stone. Its manufactures are cotton and woolen goods, flour and lumber, foundry and machine-shop products, furniture, and dairy products. It is the seat of the Cumberland University Training School. Pop. (1910) 2,299.

Macmonnies, măk-mŭn'ĭz, **Frederick William,** American sculptor: b. Brooklyn, N. Y., 20 Sept. 1863. In his 17th year he became pupil and assistant to Augustus Saint Gaudens, and going to Europe in 1884 he was admitted to the studio of Falguière, and after two years' instruction there opened a studio of his own. In 1889 his statue of ‘Diana’ was honorably mentioned in the Salon, and his ‘Nathan Hale’ in City Hall Park, New York, and ‘James S. T. Stranahan’ in Prospect Park, Brooklyn, were much admired in the Salon 1891. His ‘Bacchante’ (Salon 1894) was purchased for the Luxembourg. He has been prolific in the creations of the chisel, and his work is to be seen in Washington Memorial Arch, New York city, the Soldiers' and Sailors' Monument in Indianapolis, in the statues of Prospect Park, Brooklyn, and the Battle Monument at West Point. Since 1900 he has devoted himself more and more to painting, in which he exhibits delicacy, freshness of design, and a brilliant technique.

McMur'rich, James Playfair, American scientist: b. Toronto, Ont., 16 Oct. 1859. He was graduated from the University of Toronto in 1879, and is professor of anatomy in the University of Michigan. He has published: ‘Invertebrate Morphology’ (1894); ‘The Development of the Human Body’ (1902).

McMurtrie, măk-mėr'trĭ, **William,** American chemist: b. Belvidere, N. J., 10 March 1851. He was graduated from Lafayette College, Easton, Pa., in 1871 as a mining engineer, and was chemist-in-chief of the Department of Agriculture in Washington 1873–8. After serving as the special agent of that department at the Paris Exposition of 1878 he was professor of chemistry in the University of Illinois 1882–6, and chemist to the State board of agriculture 1886–8. In 1884 he received from the French government the title of Chevalier du Mérite Agricole, and in 1897 was elected president of the American Chemical Society. He has published ‘Culture of the Sugar Beet’ (1879); ‘Culture of Sumac’ (1879); ‘Examination of Wools and Other Animal Fibres’ (1887); etc.

McNab, Sir **Alan Napier,** Canadian statesman: b. Niagara, Ont., 19 Feb. 1798; d. 8 Aug. 1862. He entered the navy as midshipman in 1813, but soon abandoned the navy for the army; was present at the capture of Fort Niagara, and commanded the advance guard at the battle of Plattsburg. At the close of the war he studied law, and practised in Hamilton, and in 1829 was elected a member of the assembly for the County of Wentworth, and after serving three terms was returned by the electors of Hamilton. He was subsequently chosen speaker of the lower house. During the insurrection of 1837–8 he commanded the militia on the Niagara frontier, routed the insurgents near Toronto 7 Dec. 1837, and a party of American sympathizers having occupied Navy Island in the Niagara River, whence they were cannonading the village of Chippewa on the Canadian side, he sent a party to seize the steamer Caroline, employed to convey them supplies, and having driven the crew ashore, set fire to it and sent it over the Falls. Although the seizure was made on the American side of the river, the act was approved by the British government, and for his services to the crown during this insurrection McNab was knighted. In 1854 he was prime minister under the Earl of Elgin, retaining office for a few months under his successor, Sir Edmund Head. On retiring from the premiership in 1856 he was made a baronet.

MacNab, Frances. See Fraser, Alice.

McNair, măk-nãr', **Frederick Vallette,** American naval officer: b. Jenkintown, Pa., 13 Jan. 1839; d. 1900. He was educated at the U. S. Naval Academy and served in the Minnesota 1857–9. In 1861 he became lieutenant, and during the Civil War took part in the bombardment of Forts Jackson and St. Philip, the capture of New Orleans, and the destruction of the Confederate ram Arkansas. He was instructor at the naval academy 1867–8, in 1872 became commander, and in 1887 was placed in command of the Omaha in the Asiatic squadron. In 1895 he was made admiral, a member of the lighthouse board in 1898, and in July of the last named year was appointed to take charge of Admiral Cervera and other Spanish prisoners of war. Upon their return to Spain he was appointed superintendent of the Naval Academy.

Macomb, mạ-koom' or mạ-kōm', **Alexander,** American general: b. Detroit, Mich., 3 April 1782; d. Washington, D. C., 25 June 1841. He entered the United States army in 1799 as a cornet of cavalry, and at the commencement of the war with Great Britain in 1812 held the rank of lieutenant-colonel of engineers and adjutant-general of the army. In January 1814 he was promoted to be a brigadier-general and placed in command of that part of the northern frontier bordering on Lake Champlain. At Plattsburg, on 11 Sept. 1814, he sustained the attack of a greatly superior British force under Sir George Prevost, which, after the defeat of the British squadron on Lake Champlain on the same day, retreated to Canada. For his firmness and courage on this occasion he was commissioned a major-general, and received the thanks of Congress and a gold medal. In 1835 he succeeded to the office of commander-in-chief of the army, which he held until his death. He wrote a ‘Treatise on Martial Law and Courts Martial, as Practised in the United States’ (1809).

Macomb, Ill., city, county-seat of McDonough County; on the Chicago, B. & Q. railroad; about 65 miles northwest of Springfield. It is situated in an agricultural region and in the vicinity are extensive deposits of fire-clay. The first permanent settlement was made about 1841, and the place was incorporated in 1857. The chief manufactures are sewer-pipe, stoneware, and pottery. There is considerable trade in farm products, coal, and lumber. The Western Illinois State Normal School is located here, and the free public library contains about 10,000 volumes. The government is administered, under a charter of 1872, by a mayor, who holds office two years, and a council. The city owns and operates the waterworks. Pop. (1910) 5,774.

Macon, mā'kŏn, **Nathaniel,** American statesman: b. Warren County, N. C., 17 Dec. 1757; d. there 29 June 1837. He was educated at Princeton; in 1777 left college and served as a common soldier in the Continental army till the provisional treaty of peace in 1782, refusing any pay or military distinction. When the Constitution of the United States was submitted to the vote of the people of North Carolina, he firmly opposed it, on the ground that it bestowed too much power on the government, and made it in effect independent of the State. He never lost this dislike of the Constitution, and had unlimited confidence in the capacity of the people for self-government; his favorite saying being that «if left alone they would always do what was right.» He was a member of the United States House of Representatives 1791–1815, and in 1816 was elected to the Senate, where he served till 1828, when he resigned his seat, having been then a member of Congress for 37 successive years.

Macon, Ga., city and county-seat of Bibb County, near the centre, one of the most important and rapidly growing business and manufacturing centres of the New South; 86 miles by rail from Atlanta, 136 from Augusta, and 197 from Savannah. It lies at the southeastern edge of the Appalachian mountain wall, on both sides of the Ocmulgee River; which pours from the upper plateau with a fall of about 90 feet in seven miles above the city, furnishing immense power soon to be developed by electric works to operate the manufactories. It is bridged here, but is navigable thence to its mouth all the year round, even at low water, for steamers of three feet draft. Macon is the greatest railroad centre in the State except Atlanta, six lines converging there,— the Southern, Central of Georgia, Georgia Southern & Florida, Macon & Birmingham, and Macon, Dublin & Savannah,— making eleven lines radiating from it. By through traffic arrangements it is also a part of the Seaboard Air Line, Atlantic Coast Line, and Louisville & Nashville, parlor and sleeping cars running from Macon to all; 60 passenger trains a day leave the union station.

Macon lies in the midst of a fast developing cotton district, as well as one of fruit and vegetables, making it a great agricultural market; near hardwood and yellow-pine forests, hills of granite, and deposits of brick and fire clays and the finest kaolin for porcelain, all, with the cotton, furnishing raw material for its important manufactures. In more detail it is the fourth inland cotton market of the United States, only Houston, Memphis, and Augusta (Ga.) exceeding it; and handles over 200,000 bales a year, valued at over $6,500,000. It is at the edge of the Georgia peach belt, and sends away over 2,000 car-loads a season; in pears, plums, strawberries, and raspberries, besides grain and garden vegetables, it also does a great shipping as well as domestic business. But it is in manufacturing that its growth is most rapid and significant: with the attendant business accessories and banking facilities there has been a complete revolution in the past half dozen years. In 1900, it had 182 establishments, employing $5,076,005 capital and 3,963 workmen and clerks, paying $1,047,437 in wages, and turning out $6,495,767 in product; in 1903 the last three items must have at least 50 per cent added, and the first be heavily increased. By far the greatest of these was then the cotton manufacture, in which Macon was taking a high place and promising to rival the great Northern seats of the manufacture: in 1900 its product was $1,237,125, and it had increased 25 per cent within the year. Every branch of the industry is represented,— yarn, duck, cordage, twine, hosiery, and knit underwear; and it employed about a fourth of the total city wage-earners. Second only to this at present, if second, is the manufacture of cottonseed-oil for table use and packing, cottonseed meal and cake for provender and fertilizer, compound lard, plantene, and soap from the oil. This is a great and rapidly growing industry throughout the State, the seed netting the farmers half as much as the fibre; and Macon has an enormous plant started in 1896. The railroad shops which the many lines have located here turned out some $500,000 of product. Next to these in volume were lumber and planing-mill products, sash, doors, blinds, and interior finish, with a market in all the States east of the Mississippi; the present output is fully $500,000 a year. The largest vein of kaolin in the country, 30 miles wide and 35 to 70 feet deep, lies within seven miles of Macon; four companies, all established since 1900, are mining this to the extent of probably $250,000 a year, and another has recently been organized. Brick and tile, paving and roofing materials, are all part of the products of the various fine clays. Foundry and machine-shop products, agricultural implements, sewing-machine findings, carriages and wagons, furniture, barrels and firkins (especially for the great oil and lard product), brooms and brushes, saddlery and harness, confectionery (a great specialty, four factories producing some $200,000 worth a year), malt liquors, patent medicines, and artificial ice are a part of the thronging industries. The banking business for 1910 was about $125,000,000 in the gross, and the clearing-house totals over $54,249,800, a greater amount than in several Northern places of much greater population. The money-order business is about $500,000 yearly, an increase of 20 per cent in three years.

The city is on elevated sandy ground, with excellent drainage and sanitary conditions, and a mild even climate. It is a notedly handsome place, with immensely wide streets,— 100 to 180 feet,— beautifully shaded; Vineville, a part of the city, in the rear is covered with costly residences, and furnishes a noble view of the city. Central City Park with fair grounds, fully equipped, was laid out in 1870 at large cost; there are also Tatnall, Daisy, and Chickamauga parks. Rose Hill Cemetery, half a mile down the river, containing 150 acres, is of widely famed beauty. There are very interesting Indian mounds in the vicinity. It has good trolley service; and an excellent water supply from the Ocmulgee River. There are two daily papers and two public libraries; Mercer University (Baptist, 1831), Wesleyan Female College (1836, the first chartered in the country), St. Stanislaus College (Roman Catholic, preparatory for the priesthood), Mt. De Sales Academy (Roman Catholic), Home for Aged Masons, and the State Academy for the Blind (1852), with a library of several thousand volumes. There is a government building, an Academy of Music, and several charitable institutions. It is governed under the charter of 1893, with a two-year mayor and a one-chambered council. Population in 1850, 5,720; 1860, 8,247; 1870, 10,810; 1880, 12,749; 1890, 22,746; 1900, 23,272, of whom 11,561, or about half, were colored. By an act of the General Assembly at its last session, two of the principal suburbs were annexed, making the population 30,000. With other suburbs between which and the city proper is only an imaginary line, the population is (1910) 40,665.

Macon was settled about 1822, incorporated as a town in 1823, and received a city charter in 1832. It was named after Nathaniel Macon (q.v.) of North Carolina.

Bridges Smith,
Mayor of Macon.

Macon, Miss., city, county-seat of Noxubee County; on the Noxubee River, and on the Mobile & Ohio railroad; about 108 miles east by north of Jackson. The agricultural lands surrounding the city are almost wholly used for the cultivation of cotton. It has cottonseed-oil mills, cotton gins, and cotton compress. Its trade is chiefly in cotton. Pop. (1910) 2,024.

Macon, Mo., city, county-seat of Macon County; on the Wabash and the Chicago, B. & Q. R.R.'s; about 20 miles north of Moberley. Surrounding the city is a fertile agricultural region, well watered and well wooded; and in the vicinity are coal fields. The industrial establishments are foundries, machine-shops, flour-mills, wagon and carriage factories, brick yards, cigar factories, and works where dishwashing machines, shears, and agricultural implements are made. Some of its public buildings are the court-house, the county insane asylum, public and private school buildings. The city owns and operates the electric-light plant and the waterworks. Pop. (1910) 3,584.

Macoun, mạ-koon', **John,** Canadian botanist: b. Ireland, 1832. He removed to Canada at 18 and from 1868 to 1879 was professor of botany and geology in Albert College, Belleville, Ont. In 1882 he became botanist to the Geological and Natural History Survey of Canada and in 1887 assistant director. He has published 'Manitoba and the Great Northwest' (1882); 'The Forests of Canada and their Distribution' (1895).

Macpherson, măk-fẽr'sŏn, Sir **David Lewis,** Canadian statesman: b. Inverness, Scotland, 12 Sept. 1818; d. 16 Aug. 1896. He was educated at the Royal Academy in his native town, removed to Canada in 1835 and after becoming in 1842 a partner in a forwarding firm in Montreal secured in 1851, with others, a charter for a railway from Montreal to Kingston, the beginning of the Grank Trunk railway. In 1872 he became president of the Interoceanic Railway Company. He sat in the Legislative Council of Canada 1864–7, and in the last named year entered the Dominion Senate and was elected its Speaker in 1880. He was minister of the interior 1883–5 and was knighted in 1884.

McPherson, Edward, American journalist: b. Gettysburg, Pa., 31 July 1830; d. there 14 Dec. 1895. In 1848 he was graduated from the University of Pennsylvania, and although he studied law, soon gave it up for journalism. He sat in Congress 1858–66, was clerk of the House of Representatives 1863–73, 1881–3, and 1889–91, in 1876 permanent president of the National Republican Convention, and was chief of the bureau of engraving and printing in Washington 1877–8. He edited the Philadelphia *Press* 1877–80, was for some years the American editor of the 'Almanach de Gotha,' edited from 1872 a biennial 'Handbook of Politics,' and edited the 'New York Tribune Almanac' from 1877 till his death. He was the author of a 'Political History of the United States during the Great Rebellion' (1865); and 'The Political History of the United States during Reconstruction' (1870).

Macpherson, James, Scottish author and translator: b. Inverness-shire 1736; d. 1796. He studied at Aberdeen and Edinburgh. Having published 'Fragments of Ancient Poetry,' translated from the Gaelic or Erse language, a subscription was raised to enable him to collect additional specimens of national poetry. He produced, as the fruit of his researches, 'Fingal, an Ancient Epic Poem,' translated from the Gaelic (1762, quarto); 'Temora and other Poems' (1763), professedly translated from originals by Ossian, the son of Fingal, a Gaelic prince of the 3d century, and his contemporaries. The question of the poem's authenticity gave occasion for violent controversy. From the evidence of the contending parties it may be concluded that Macpherson's prose epics were founded on traditional narratives current among the Highlanders; but the date of the oldest of their lays is comparatively modern, and it is now impossible to ascertain the precise extent of his obligations to Gaelic bards. He had a life allowance from the government, and was agent to the Nabob of Arcot, having also a seat in the House of Commons 1780–90. He was also the author of a very inadequate prose translation of Homer's 'Iliad' and of some other works.

McPherson, James Birdseye, American soldier: b. Sandusky, Ohio, 14 Nov. 1828; d. Atlanta, Ga., 22 July 1864. He was graduated from West Point in 1853. Appointed brevet 2d lieutenant of engineers, he was assistant instructor of practical engineering at West Point, 1853-4, and after serving on fortification and construction duty, 1854-61, applied for active employment in the field at the opening of the Civil War. In May 1862 he was appointed brigadier-general of volunteers and was with Halleck at the siege of Corinth. For his services on this occasion he was made major-general of volunteers in the following November. He took an important part in the siege and capture of Vicksburg and was in consequence promoted to brigadier-general in the regular army 1 Aug. 1863. In March 1864 he was made commander of the department and army of the Tennessee and performed distinguished services in the campaign of Georgia. In the following July he commanded in the engagements around Atlanta and was killed during a reconnoissance.

McPherson, Kan., city, county-seat of McPherson County; on the Union P., the Atchison, T. & S. F., the Missouri P., and the Chicago, R. I. & P. R.R.'s; about 150 miles west by south of Topeka. The city is the trade centre of an extensive agricultural region in which the chief products are wheat and corn. It has flour-mills, creameries, grain-elevators, brick and lumber yards. Its trade is chiefly in farm and dairy products and in live-stock. Its principal buildings are a court-house, high school, and opera house. It is the seat of the McPherson College, under the auspices of the German Baptists. Pop. (1910) 3,546.

McQuaid, Bernard John, American Roman Catholic prelate: b. New York city 15 Dec. 1823; d. Rochester, N. Y., 18 Jan. 1909. After studying in Canada, he completed his course at St. John's College, Fordham, N. Y., where he graduated in 1843, and for the next three years held the position of tutor. He studied theology first with the Lazarists of New York city and later at Saint John's College, Fordham, being ordained priest January, 1848. Having built churches at Morristown and Springfield, N. J., he was engaged upon one at Mendham when summoned to the newly created diocese of Newark, N. J., 1853. In 1856 Father McQuaid founded Seton Hall College at Madison, N. J., and was its first president, retaining the office for ten years, and its subsequent success has been eminently due to his indefatigable efforts. He was consecrated first bishop of the diocese of Rochester, N. Y., by Archbishop McCloskey in New York city 12 July 1868. With characteristic energy he discharged his episcopal duties, the cause of Catholic education ever appealing to him as one of paramount importance. With a view to advancing it he invited the Sisters of Saint Joseph to conduct new parochial schools in his diocese and likewise founded Saint Andrew's Preparatory Seminary. The parochial schools of his diocese have a larger attendance in proportion to the Catholic population than that of any other diocese in the United States. He was spiritual adviser of the Ladies' Catholic Benevolent Legion. His diocese comprised a Catholic population of approximately 110,000; 142 priests; 122 churches; 1 theological seminary; 1 preparatory seminary; 45 parochial schools; 4 orphanages; 2 hospitals, etc.

MacQueary, mạ-kwē'rĭ, **Thomas Howard,** American educator: b. Charlottesville, Va., 27 May 1861. He was graduated from the Episcopal Theological School at Alexandria, Va., in 1886, took orders in the Episcopal Church and in 1882 became rector at Canton, Ohio. His religious views having undergone a radical change he was tried by an ecclesiastical council for denial of miracles and suspended from the ministry for six months. He accordingly resigned from it in September 1891, and was for some time in the Universalist ministry. He founded Unity House Social Settlement in Minneapolis, from 1900-6 was superintendent of the Parental School in Chicago, and since 1906 has been head of the department of history, Yeatman High School, St. Louis. He is the author of 'The Evolution of Man and Christianity' (1889); 'Topics of the Times' (1890).

Macquoid', **Katherine Sarah Thomas,** English novelist: b. Kentish Town, London, 26 Jan. 1824. She was married to T. R. Macquoid, a water-color artist, in 1851. Besides many pleasing volumes of travel, such as 'Through Normandy' (1874); 'Through Brittany' (1877); 'In the Ardennes' (1881); 'About Yorkshire' (1883); 'In the Volcanic Eifel,' with her son, Gilbert Macquoid (1896), she has written a long series of novels, not a few of which have been widely read in the United States. Among these may be cited: 'Patty' (1871); 'In the Sweet Spring Time' (1880); 'Little Fifine' (1881); 'At the Red Glove' (1885), by some critics considered her best work; 'The Haunted Fountain' (1890); 'His Last Card' (1895). Her volumes of travel are illustrated by her husband.

Macrauchenia, măk-râ-kē'nĭ-ạ, a genus of fossil South American herbivorous animals, forming a connecting link between the palæotherium and the camel family; in form they nearly resemble the llama, but were as large as a hippopotamus. Their remains have been gathered nearly completely from the Pampas formation of Argentina and Bolivia.

Macready, mạ-krē'dĭ, **William Charles,** English tragedian: b. London 3 March 1793; d. Cheltenham 27 April 1873. He received his education at Rugby, and originally had the intention of adopting one of the learned professions. The change in his career was brought about by his father, a theatrical manager, having fallen into embarrassed circumstances, to relieve which he joined his father's troupe, then acting at Birmingham. He appeared there for the first time in 1810 in the character of Romeo, in which he was successful. On 16 Sept. 1816 he made his first appearance on the London boards, acting Orestes in 'The Distressed Mother,' at Covent Garden Theatre. He did not achieve an immediate triumph in London, but gradually rose in popular favor. His Virginius was the first of his London successes. From the time when he appeared in this part he continued steadily to improve as an actor, and his successes were no longer confined to the lower walks of the profession. In 1842 he became a theatre manager at Drury Lane, but met with no success, so that he resigned at the end of the second season. His managership at Drury Lane had brought upon him considerable loss, to repair which he visited America (1849). On his return to London he gave some farewell performances, and then retired from the stage in 1851.

Macrobius, mạ-krō'bĭ-ŭs, **Ambrosius Aurelius Theodosius,** Latin author of the 5th century A.D. The country of his birth is uncertain, but it is inferred from the fact that he speaks of Latin as a foreign tongue to him, that he was probably a Greek. He was the author of a miscellaneous work entitled 'Saturnalia,' curious for its criticisms, and valuable for the light it throws upon the manners and customs of antiquity; a commentary on Cicero's 'Somnium Scipionis,' in two books, valuable for the exposition it affords of the doctrines of Pythagoras with respect to the harmony of the spheres; and a treatise, 'De Differentiis et Societatibus Græci Latinique Verbi.' Consult Von Jan, 'Macrobius'; and Eyssenhardt, 'Macrobi Opera.'

Mac'rocosm. See MICROCOSM.

Macrothe'rium, a genus of extinct ungulate mammals, in some cases of gigantic size, found most completely in the Miocene deposits of Europe, but also known from China and western North America. It represents the primitive group *Ancylopoda,* which had a wide geographical range in the Miocene and Pliocene epochs when it became extinct. The structure of the curiously twisted feet so much resembles that of the ground-sloths that for a long time the macrotheres, as well as their companion, but more generalized genus *Homalodontotherium,* were regarded as edentates. Consult Woodward, 'Vertebrate Palæontology' (1898).

Macru'ra. See DECAPODA.

MacVeagh, măk-vā', **Wayne,** American lawyer and diplomat: b. Phœnixville, Pa., 19 April 1833. He was graduated from Yale in 1853 and after studying law was admitted to the bar in 1856. He was district attorney of Chester County 1859–64, became prominent as a Republican leader, and conspicuous in his profession, and in 1870–1 was minister to Turkey. He was an active opponent of «machine politics» and in 1872 led the Republican opposition to Simon Cameron, his father-in-law. He was chairman of the «MacVeagh Commission» sent by President Hayes to Louisiana in 1877 to act as the President's unofficial representative and aid in adjusting political differences there. He was attorney-general of the United States, March to September 1881, and was ambassador to Italy 1893–7.

McVickar, măk-vĭk'ar, **William Neilson,** American Protestant Episcopal bishop: b. New York 19 Oct. 1843; d. 28 June 1910. He was graduated at Columbia College (1865); and at the General Theological Seminary (1868). He was ordained deacon (1867) and priest (1868). Being elected coadjutor bishop of Rhode Island, 19 Oct. 1897, he was consecrated 27 Jan. 1898, and on the death of Bishop Clark, September 1903, succeeded to the see.

Ma'cy, Jesse, American historian: b. Henry County, Ind., 21 June 1842. He was graduated from Iowa College in 1873, and has been a member of the faculty there since that date, becoming professor of constitutional history and political science in 1885. He has written 'Civil Government in Iowa' (1881); 'Institutional Beginnings in a Western State' (1883); 'Our Government' (1886); 'A Government Text-Book for Iowa Schools' (1887); 'The English Constitution' (1897); 'Political Parties in the United States, 1846–1861' (1900); and numerous magazine articles.

Mad Anthony, a nickname given to the Revolutionary general Anthony Wayne (q.v.) on account of the seeming recklessness of his brilliant military feats.

Mad Apple, the fruit of an American nightshade, especially that called Sodom apple (*Solanum sodomiæ*), the eating of which produces poisonous intoxication.

Mad Mul'lah, term applied to Mohammed Ali, the Mahdi, or Moslem Messiah: b. Somaliland 1843; d. 1884. In his youth Mohammed was initiated into the mysteries of the occult sciences and sorcery. These he learned among the tribe of the Danakil, which has always been renowned for its magicians. A study of the Koran and the Arab writings followed in the Marabout school. When quite young the future Mullah was taken with the idea of making the pilgrimage to Mecca, and not content with one journey made the sacred visit three or four times. His object was to obtain a greater reputation for holiness than that held by the other pilgrims.

After his last pilgrimage Mohammed returned to Berbera, but met with small success in that commercial town. Seeing no prospect before him but that of remaining a poor, begging pilgrim, he determined to strike out a new line for himself, and established himself among a powerful inland tribe. Here he made his position secure by his appearance of holiness, his impressive airs, and the assurance with which he made his prophecies. At this time and hereafter the magic learnt in his boyhood stood him in good stead whenever his holiness was not able to overawe his somewhat turbulent followers. He assumed the title of Mullah (priest and heaven-sent), and even that of Mahdi (prophet). Overwhelmed with presents by his credulous followers, he was soon among the richest of the land, and with his riches his influence grew apace.

His pride waxed very great, and one day he ordered all the Korans of the ordinary priests to be burned, saying that he himself was the living Koran, and that he was to be obeyed as a new prophet sent from Allah. Not content with persuasion, the Mullah, following the example set by Mohammed the Great, threatened with death all those who disbelieved, and in following up these threats caused the disturbances which brought about the Somaliland campaign. Possessing the power of calling forth the enthusiastic support of the tribesmen, the Mullah has not had to rely upon himself alone for the conduct of his campaigns. If report speak truly, besides the Austrian, Karl Inger, he had as lieutenant an English naval officer. In 1881 he destroyed the Egyptian army despatched against him. He died of smallpox. See EGYPT, SUDAN.

Consult Darmesteter, 'The Mahdi' (1885); Hoffmann, 'Mahdithum' (1899); E. Müller, 'Beiträge zur Mahdilehre des Islams' (1901).

Madach, mŏ'däch, **Emerich,** Hungarian poet: b. Also-Sztregova 21 Jan. 1823; d. there 5 Oct. 1864. He studied law, was a notary in his native country, and was also active as an orator and journalist. He wrote on archæology and æsthetics; and both lyric and dramatic verse. His principal works are the two dramatic poems, 'Moses' (1860); and 'The Tragedy of Man'

(1860). The latter owes much to 'Paradise Lost,' and to 'Faust,' but is yet a remarkable performance. Though strongly contemplative in character, it was successfully presented to Austria and Hungary in 1830. There is an excellent rendering in German by von der Lech (1888). Consult: Fischer in 'Auf der Höhe,' Vol. XVI. (1885).

Madagascar, măd-ạ-găs'kạr, an island in the Indian Ocean, since 1896 a French colony. It is separated by the Mozambique Channel from the southeast coast of Africa, the nearest point being 230 miles distant. It is 975 miles long from Cape St. Mary in the south to Cape Amber in the north, has an average breadth of 250 miles, and an estimated area of 227,750 square miles, being after Greenland, New Guinea, and Borneo, the fourth largest island in the world.

Topography.—Madagascar consists of an elevated region with an average height of from 3,000 to 5,000 feet overlooked by mountains rising in some cases to nearly 9,000 feet above the sea-level. This plateau occupies a much larger proportion of the surface in the north and east than in the west and south, and the greater portion of the island south of lat. 23° S. belongs to a much lower region which does not consist entirely of plains, but is interrupted toward the west by three prominent chains of hills stretching from north to south, one of them apparently in a continuous line about 600 miles in length. The coast exhibits a number of indentations, mostly small, but few good harbors, being in great part rock, though in some places low and sandy.

Hydrography.—The rivers are numerous; few of them offer the advantages of internal navigation. The chief rivers have their courses on the west and northwest sides of the island. The Betsibóka with its affluent the Ikiopa, unitedly measuring 300 miles, may be ascended by light steamers for 100 miles; the Tsìribìhina has a somewhat shorter course, but drains by its numerous tributaries a much larger area. The eastern rivers descend from the high land through magnificent gorges, forming a succession of rapids and cascades, the falls in some instances having a descent of 500 feet. There are few lakes of any size as yet known to explorers; one of the largest is Alàotra Lake, measuring 25 miles long; the others do not reach a length of 10 miles. A long chain of lagoons having very short distances between each and often expanding into wide sheets of water stretches for nearly 300 miles along the east coast.

Geology.—Geologically the elevated region consists almost entirely of granite and other igneous rocks, while the lower region is composed chiefly of secondary formations. The former region is traversed by a line of extinct volcanic craters, some of which show signs of comparatively recent activity. Among the more remarkable fossils are remains of a huge struthious bird, the Epiornis, whose egg, measuring 12 by 9 inches, is larger than that of any other known bird. The minerals include iron in abundance, gold, lead, and copper, all more or less worked, while in the northwest coal is found.

Climate.—The climate is various; the heat on the coast is often very intense, but on the high lands of the interior the temperature is more moderate. On the coast the rains are nearly constant, beginning in the evening and sometimes lasting all night; in the interior the winter is dry and agreeable. The greatest amount of rainfall takes place on the east coast, and especially on the northeast, the part directly exposed to the summer monsoon. The elevated region of the interior and the districts on the west coast are tolerably healthy for Europeans, but owing to the large extent of marsh and lagoon on the east, malarial fever prevails, and is frequently fatal to natives from the interior as well as to Europeans. Snow is never found on even the loftiest mountains.

Ethnology.—The inhabitants, known by the name of Malagasy, belong to the Malayo-Polynesian stock and speak a Malayan language. They appear to form substantially a single race, though they have received a considerable intermixture of African blood and a certain amount of Arab intermixture. They are divided into numerous tribes, each having a distinctive name and customs. The Hovas are the predominant tribe; their proper country is the elevated region of the interior, but they extended their sway over nearly the whole island. Among the other chief tribes are the Betsimasaraka on the east coast, the Betsileo in the south central region, and the Sakalava on the west and north. The people are socially divided into three classes: Adrians or nobles, Hovas (in a special and restricted use of the word) or free commoners, and Andevos or slaves. This last section consists, or till recently consisted, partly of debtors and criminals and their descendants, partly of Africans brought over in slave-dhows, and partly of the descendants of other tribes conquered by the Hovas. The Africans were, however, formally set free in 1877. In the coast districts the houses of the better class are built of framed timber with lofty roofs covered with shingles or tiles; the dwellings of the lower classes are constructed of bamboo or rushes, or even of clay. In former and more unsettled times the villages were almost always built on the tops of hills, but during the 19th century this precaution has not been deemed so indispensable.

Flora.—The most striking feature in the vegetation is a belt of dense forest with an average breadth of 15 to 20 miles passing round the whole island, and broken only by a gap in the northwest, where the two ends of the forest overlap. It is found at all levels from 6,000 feet to the water's edge, which it touches on the northeast, where it reaches its greatest breadth of 40 miles. The trees of this forest include many species of lofty palms, hardwooded exogens supplying a great variety of beautifully veined and durable timber, and a large number of trees remarkable for the splendid character of their blossoms. Of all the trees of Madagascar the most striking is the ravinala or traveler's-tree (*Urania speciosa*); it resembles a palm, its stem being crowned by a semicircle of oblong leaves spread out vertically in a fan shape. It owes its name to the fact that the traveler may supply himself with water from it by piercing or breaking the lower ends of the leaf-stalks.

Fauna.—Madagascar has a singularly local fauna which, although upon the whole related to Africa, is so peculiar to itself that with a few neighboring islets, it forms a very distinct subprovince of the African region. Its characteristics show plainly that the separation of the island from the continent occurred at a very ancient time. Another singular feature is the presence of various forms of animal life represented elsewhere only in Oriental Australian regions, with a marked resemblance in a few animals, for example the boas, to South America. From this it is plausibly argued that in early Tertiary times there was a land connection between Madagascar and India and the region thence to Australia, now presented only by the islands of the Malayan Archipelago. (See LEMURIA.) In its mammals Madagascar is singular in what it lacks, as well as in its possessions. It has none of the cattle, equine animals, elephants, rhinoceroses, hogs or even rodents of Africa, except a mouse or two; no lion or true cat or dog of any kind; and no monkeys. On the other hand is has several small insectivora, closely allied to tropical American species; the great majority of all the lemurs, the few outsiders being in Africa and the Orient; and several viverrine quadrupeds, which there take the place of the predatory cats. The modern birds are less striking in their peculiarities, but in the zoological era immediately preceding the present the island possessed those huge ratite birds, the epiornis and its relatives, which gave rise to the story of the roc. Many forms of huge land tortoises were also members of this singular fauna. The fishes, amphibians, reptiles, and lower forms are largely peculiar.

Crocodiles are numerous in the rivers and lakes, and many species of lizards, chameleons, and tree-frogs abound in the forests. Among the insects are numerous brilliantly colored beetles, butterflies, moths, flies, locusts, and spiders, venomous species of the latter as well as scorpions and centipedes being present. See ZOOGEOGRAPHY.

Agriculture. — Of the vegetable products grown for food by far the most important is rice, the staple food of the inhabitants; next in importance come manioc or cassava, sweet-potatoes, beans, tomatoes, ground-nuts, and yams. Ginger, pepper, and indigo grow wild in the woods; cotton, sugarcane, coffee, tobacco, and hemp are cultivated. Humped cattle are found in immense herds, and form a large part of the wealth of the inhabitants; they appear to have been introduced from Africa at a remote period, as the fat-tailed sheep, goats, swine, and horses have been more recently. Under French administration agriculture and cattle-raising are undergoing considerable extension. General Gallieni, the military governor, foreseeing that, for want of French colonists, Madagascar was likely to become a burden on the hands of France, devised a plan in 1899 to hasten the settlement of the country, the efficiency of which has since been proved by practical tests. The country not being thoroughly pacified, a large army of occupation is garrisoned there. Upon the expiration of their terms of enlistment these men are offered large land grants and an annual subsidy from the French government of 2,250 francs ($434) for two consecutive years. In return for these privileges these settlers pledge themselves to reside three consecutive years on the territory allotted to them. During this period they are to cultivate the soil to the best of their ability. They are furthermore obliged to hold themselves in readiness to aid in the defense of the settlements against hostile natives. This experiment was begun with 36 men honorably discharged from the army, their concessions aggregating 8,000 acres, and two years later the issue of the official report of the transactions of the colonial office showed that the plan was successful. Under the intelligent guidance of agricultural experts the country was planted with the staples for cultivation to which it was best adapted, and many of the successful farmers after the first year sent to France for their relatives.

Commerce and Industries. — Rice, cattle, hides, gum, india-rubber, wax, cotton, sugar, vanilla, lard, coffee, gold, gum-copal, and dyewoods are exported. The chief imports are cotton goods, wines and spirits, metals, rice, and flour. In 1908 the total value of imports was £1,206,674, of exports £898,151; the value of the gold exported being $660,000. In general the Malagasy show much aptitude for the manual arts. As silversmiths, gunsmiths, and carpenters, they rapidly acquire the skill of Europeans; and with hand-looms of the rudest construction the only ones as yet in use, they make excellent and handsome cloths. The principal article of native dress with both sexes is the *lamba,* a piece of cloth about three yards long and two broad, which is folded round the body above the arms, one end being thrown over the shoulder.

The island is being rapidly opened up by the building of highways, a carriage road, and a railroad having been completed between Tamatave, the chief port and capital, and Antananarivo (q.v.), the ancient capital.

Government. — Prior to 1895 the government was a native absolute monarchy. A French Resident, however, with a military escort, resided at the court and controlled foreign relations, so that the country was virtually a French protectorate. Much friction prevailed in 1893-4, between the government and the French authorities, and finally France decided to make her protectorate of the island effective. An expedition easily overcame the resistance of the Hova troops, and after some changes in the formation of the administration the island was made a French colony, and General Gallieni was appointed resident-general and commander-in-chief in September 1896. His vigorous and determined policy made a great improvement in the condition of the country. He is assisted by an administrative council, and natives are largely employed in the civil and military administration. An educational system provides primary schools for boys and girls, four normal schools, a school of practical agriculture, two regional schools for agriculture and industries, and a school of medicine. Numerous Catholic and Protestant mission schools have long been established in the island. The religion of the great bulk of the people is a kind of fetishism or worship of charms. Many of their superstitious customs have been abolished and Christianity adopted, chiefly by the Hovas, the Catholic cult prevailing. A court of appeal and tribunals throughout the provinces provide for native justice, while there are special courts for the administration of French justice. The local revenue is derived chiefly from direct taxation, from customs and other indirect taxes, from colonial lands, posts and telegraphs, markets, etc., and from subventions granted by France. The chief branches of expenditure are general administration, public works, post-office, and public debt, the latter being a large item.

Population.—According to the latest census, the population amounted to 2,701,000, of whom 2,690,381 were natives, 9,694 European, 1,000 Asiatic and African; the Hovas, the chief native tribe, numbered 850,000.

History.— Madagascar was known to the traveler Marco Polo at the end of the 13th century and had been visited for several centuries by the Arabs. In 1506 it was visited by the Portuguese, who gave it the name of St. Lorenzo. Toward the end of the 17th and during the most of the 18th century the French endeavored to form military stations on the east coast, but with no lasting results. A settlement was established at Fort Dauphin in the southeast and held for some time, but in consequence of the tyrannical behavior of the French settlers they were massacred by the natives and the place destroyed. The French, however, struggled hard and successfully to retain the islands of Ste. Marie on the east coast and Nossi-bé on the northwest. Previous to 1810 Madagascar might be said to have been divided among numerous petty chiefs, almost constantly at war with each other. In that year, however, Radama I., a prince of remarkable intelligence, became king of the Hovas, and began to enforce a claim by right of conquest to the sovereignty of the whole island. He saw that if his people were to be prosperous they must first be educated and civilized. In return for the promise of co-operation in putting down the slave-trade on the coast of Mozambique, he received arms and other assistance from the British, by which he was enabled to carry on his conquests. Christian missionaries began to teach in the capital in 1820, many converts were made, the Bible was translated into the Malagasy tongue, the language was first reduced to a systematic written form, and printing was introduced. Great improvements had taken place in the manners of the people when Radama died in 1828, and was succeeded by his chief wife, Ranavalona, a woman of cruel disposition, and opposed to all innovation. The native converts were persecuted, many of them being put to death, and the island was closed to Europeans. This reign of terror ended at last in 1861, when the queen died, and was succeeded by her son Radama II., who, himself a Christian, reopened the island to European missionaries and traders, and proclaimed the emancipation of the African slaves. He appears, however, to have been a weak prince easily swayed by native and foreign favorites, and he unwisely granted extensive territories and privileges to an enterprising French company, an act which lost him the affection of his nobles, and led to his assassination in 1863. His wife Rasoherina was placed on the throne, and the government repudiated the concessions made to the French, offering 1,000,000 francs as compensation. After a quiet and prosperous reign of five years this queen died, and was succeeded by Ranavalona II. in 1868. After she had been elected queen she and a great number of her courtiers became Christians, and many reforms favorable to enlightenment and humanity were perseveringly carried out. She was succeeded in 1882 by Ranavalona III., when the French brought forward their claims on the Malagasy territory, which being refused, led to hostilities in 1883-5. This war was terminated by a treaty, under which France acquired protectorate rights over Madagascar; but hostile feeling toward the French again led to war in 1895, with the result that the queen was deposed and exiled first to the island of Réunion, and thence in 1899 to Algiers, while Madagascar became a French colony.

Consult: Dawson, 'Madagascar: its Capabilities and Resources' (1895); Keller, 'Madagascar, Mauritius and Other East African Islands' (1900).

Madame Bovary, mă-dăm bō-vā-rē, a novel by Gustave Flaubert, which appeared in 1856, when the author was 35. It was his first novel, and is regarded as the book which founded the realistic school in modern French fiction— the school of Zola and Maupassant. The novel is a powerful, unpleasant study of the steps by which a married woman descends to sin, bankruptcy, and suicide. The time is the first half of the 19th century; the action takes place in provincial French towns.

Mad'den, Frederick William, English librarian: b. London 7 April 1839. He is a son of Sir Frederick Madden, a noted antiquary, and was chief librarian of the Brighton Public Library, 1888-1902. He is a member of various numismatic societies, and among other works has published 'Handbook of Roman Numismatics' (1861); 'History of Jewish Coinage and Money in the Old and New Testaments' (1864); 'The Coins of the Jews' (1881).

Mad'der, (1) in botany, the English name of the plants of the genus *Rubia*, especially *R. tinctorum*. It is a trailing or climbing annual, supporting itself by its leaves and prickles. It is supplied chiefly from Holland, France, Italy, and Turkey. The roots, which are ready the third year, are kiln-dried, and then threshed. They are then dried a second time, and afterward pounded and stamped in a mill. Indian madder, called also madder of Bengal, is *R. cordifolia;* madder of Chile *R. augustissima* or *Relboum*. (2) In chemistry, the root of *R. tinctorum* is extensively used in dyeing for the production of a variety of colors, namely, red, pink, purple, black, and chocolate. Other species of *Rubia* are also used. It would appear that madder contains a colorific principle — rubian — which, under the influence of a peculiar ferment, termed erythrozym, breaks up into alizarin, purpurin, etc. The colors produced from madder are very stable, the well-known Turkey-red being one of them. Madder also contains certain yellow coloring matters, but they are useless, if not injurious, in the process of dyeing. (See DYES; DYEING.) (3) In pharmacy, madder is a tonic, a diuretic, and an emmenagogue. Brown madder, a rich red-brown pigment, prepared from the roots of *R. tinctorum*.

Mad'dox, Richard Leach, English physician and chemist: b. Bath, England, 4 Aug. 1816; d. Portswood, Southampton, 11 May 1902. He studied medicine at University College, London, but was graduated M. D. at Edinburgh. In early life he settled and practised his profession in Constantinople, and here first took up the study of photography. He subsequently left the Bosphorus for Smyrna and was a civil surgeon in the military hospitals at Scutari during the Crimean war, and finally settled at Woolston, near Southampton, England. It was during his residence at Woolston, which lasted until

1874, that he worked out the process which has revolutionized the art of photography, by substituting the gelatino-bromide for the collodion plate. With him originated the gelatino-bromide dry plates to take the place of the wet collodion plates which, besides other inconveniences, sometimes produce an atmosphere which is dangerous to the operator's health. There have been more than one claimant to the credit of this discovery, but it is decided by the 'Scientific American' that Dr. Maddox is entitled to all the honor of the invention. The sub-committee of the Committee of Sciences and Arts of the Franklin Institute of the State of Pennsylvania awarded him the Scott Legacy medal and premium as the author of the invention.

Madeira, ma-dē'ra (Port. mä-dā'ē-rä), a group of Atlantic islands belonging to Portugal, opposite and about 440 miles distant from Sali, Morocco, on the west coast of Africa, and about 600 miles southwest of Lisbon. Madeira, the principal island, and the islets of Porto Santo, Dezerta Grande, and Bugio, compose the group, with an area of 505 square miles, and a population about 151,125. The main island (area, 313 square miles) consists of a collection of mountains of volcanic origin, the most elevated of which is upward of 6,000 feet high. Through the west half of the island runs a central ridge about 5,000 feet high, on which is an extensive plain called Paul de Serra. The east portion of the island, though elevated, is less so than the west. From the central mass steep ridges extend to the coast, where they form perpendicular precipices of from 1,000 to 2,000 feet high. These cliffs are indented by a few small bays, where a richly cultivated valley approaches the water between abrupt precipices, or surrounded by an amphitheatre of rugged hills. These narrow bays are the sites of the villages of Madeira. The most striking peculiarity in the mountain scenery of the island is the jagged outline of the ridges, and the deep precipitous gorges which cut through the highest mountains almost to their very base. The road round the island is in many places exceedingly picturesque, being led often between lofty cliffs, or along the front of precipices overhanging the sea. The Madeiras were known to the Romans under the name of *Purpurariæ Insulæ*. They were rediscovered by the Portuguese in 1420, and the name Madeira was given to the principal island from the magnificent forests of building timber (in Portuguese *madeira*) which then covered it. It was settled by the Portuguese in 1431. Funchal, the capital (pop. about 37,000), is an episcopal see. The mean annual temperature of Madeira is 65°, and the climate, from its constant and temperate warmth, is well known for its favorable effects on those suffering from pulmonary and other complaints, which renders the island a favorite resort of invalids from Britain and elsewhere. Large and well-appointed hotels exist at Funchal. The staple product of Madeira is wine, the quantity of which in good years prior to the appearance of the vine disease in 1852, amounted to 2,750,000 gallons. In 1898 there was an export of 587,000 gallons valued at about $890,000. Sugarcane, and the cactus for the rearing of cochineal, are cultivated, fruit and vegetables are grown, fisheries are actively engaged in, linen, woolens, leather, straw hats, baskets, soap, sugar, spirits, butter, etc., are manufactured. A total of 1,635 vessels of 4,692,264 tons entered and cleared the island ports in 1899. The chief import is coal, the most important of the others being wheat, rice, Indian corn, and dry goods.

Madeira, or **Cayari**, Brazil, a large navigable affluent of the Amazon, about 800 miles long, formed by the united streams Beni, Mamore, and Guaporé, on the frontiers of Brazil and Bolivia. Just northeast of the frontier the navigation is interrupted by rapids, to avoid which a railway is being constructed. The length from the source of the Mamore is nearly 2,000 miles.

Madeleine, mäd-lān, **La**, a church in Paris, in a square of the same name, commenced in 1764. It was remodeled and changed after the Revolution, and in 1832 was completed at a cost of $3,000,000. The church is built in the form of a Roman temple and is 100 feet high, 354 feet long and 141 feet wide. The bronze doors by Triqueti are 35 feet high and 16 feet in width. The building, which has no windows, is lighted from above.

Madhava, mä'dha-va, another name of the Hindu god Vishnu (q.v.).

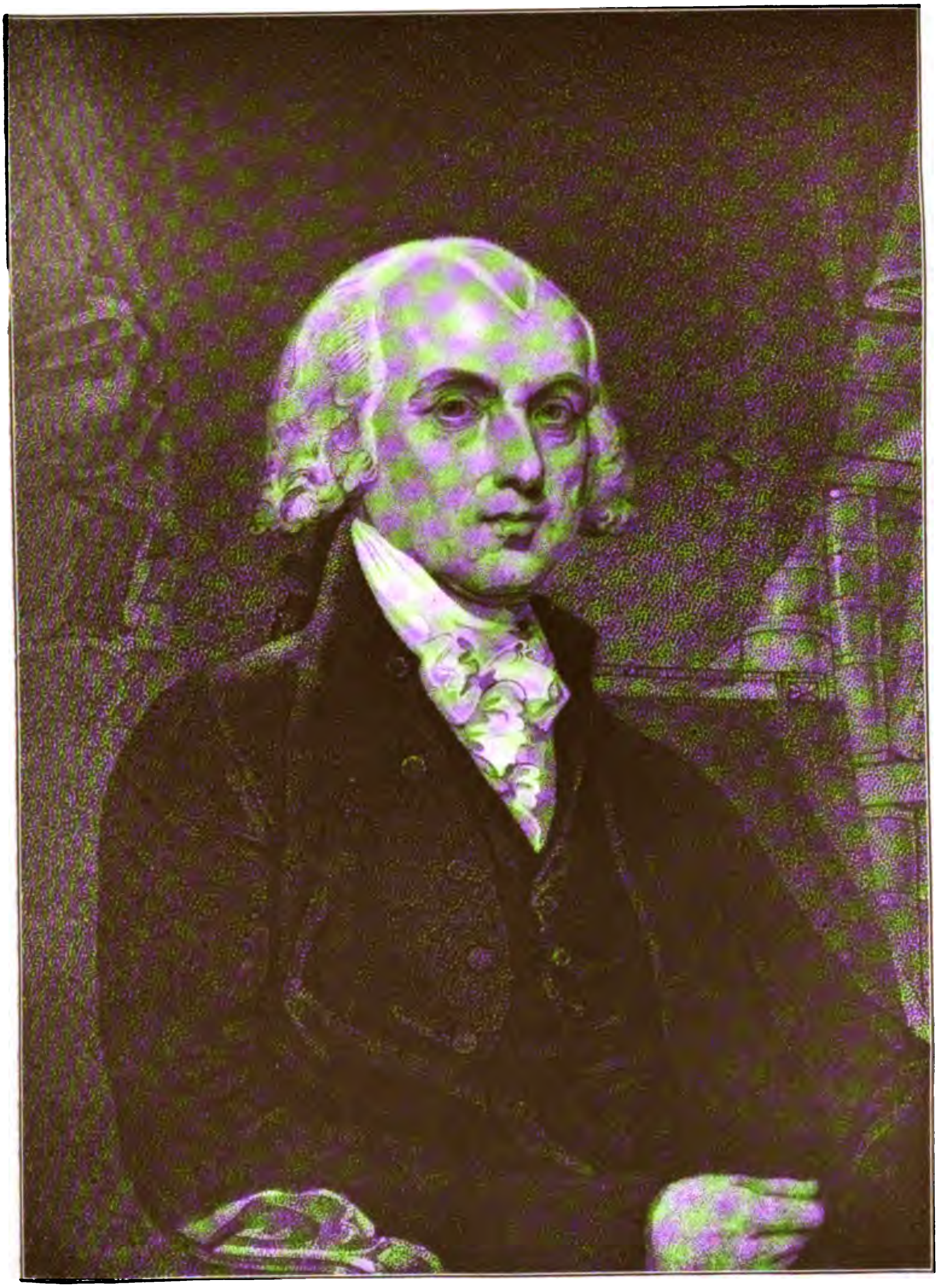
Ma'dia Oil, oil expressed without heat from the seeds of *Madia sativa*. It is transparent, yellow, odorless, and may be used on the table as a substitute for olive oil, or for oil-cake for cattle. The plant is a composite, native to southern South America, but has long been cultivated in Europe for its oil-bearing seeds.

Mad'ison, James, American Protestant Episcopal bishop: b. Rockingham County, Va., 27 Aug. 1749; d. 6 March 1812. He was graduated at William and Mary College in 1772, studied law, and was admitted to the bar, but soon after abandoned law for divinity. In 1773 he was chosen professor of mathematics in William and Mary College, and in 1775 went to England and was admitted to orders by the bishop of London. In 1777 he was elected president of the college, and during the American Revolution succeeded in keeping the college in active operation. Having been chosen as bishop of Virginia he was consecrated by the archbishop of Canterbury, in Lambeth palace, 19 Sept. 1790. He continued to discharge the duties of president of the college, and professor of natural and moral philosophy, international law, etc., with those of the episcopate, until his death. His only publications were several occasional discourses, and a 'Eulogy on Washington' (1800).

Madison, James, fourth President of the United States: b. Port Conway, Va., 1751; d. Montpelier, Va., 28 June 1836. Madison was the eldest son of James Madison, a Virginia planter, and of Nelly Conway, daughter of Francis Conway, of King George County, Va. His father, a man of independent means, lived on an estate now known as Montpelier in Orange County. James was born at Francis Conway's home on the Rappahannock while his mother was on a visit to her parents. His educational advantages were excellent for the times; he attended the school of a Scotchman, Donald Robertson, was well prepared for college by the clergyman of the parish, the Rev. Thomas Martin, and entered Princeton in 1769. His application to his studies was excessive, and was in part the cause of later ill health; he succeeded, however, in taking the studies of the last two years in one year and took his B. A. degree in 1771. He remained at Princeton for another year doing special work in Hebrew under Dr. Witherspoon, the president. After his return home he tutored his younger brothers and began a systematic course of reading in theology, philosophy, and law. At this time his study of Hebrew and theology seem to indicate a desire to enter the ministry, but he soon abandoned this and prepared himself for the legal profession and for public service. His theological studies bore good fruit later as is evidenced by the stand he took for religious liberty.

Madison was by instinct a politician and not a soldier; he took no active part in the Revolutionary War, but as early as 1774 he was appointed a member of the Committee of Public Safety for Orange County, and in 1776 was elected delegate to the convention which framed the constitution of Virginia. From that time until he retired from the Presidency he was honored with high public offices by his State and by the nation. In the Virginia Convention Madison succeeded in substituting for a clause in the Bill of Rights permitting the «fullest toleration» in religion, a clause allowing the «free exercise of religion.» This was a distinct blow to religious intolerance for, as he said, toleration implies jurisdiction, and the State should have no coercive power over religious thought. He was a member of the first Virginia Assembly but failed of re-election because, as his biographer Rives tells us, he refused to conform to the universal custom of his day and «treat» his constituents; he was, however, made a member of the governor's council and so distinguished himself that in 1780 while still under thirty he was chosen as delegate to the Continental Congress. In this Congress he was conspicuous for his opposition to the issuance of paper money by the States; for his efforts to secure for Congress the right of taxing imports, and for his determined stand to retain for the States the right of navigation on the Mississippi. Madison saw clearly that a government so organically weak that it could not enforce its requisitions and could pay its debts only by increasing its debt could never be effective; hence he labored unceasingly to enlarge the power of the central government. The office of delegate was limited to one term, so Madison was not returned to Congress in 1784, but the high esteem in which he was held was shown by his immediate election to the State Assembly. Virginia was a very influential State and her attitude toward national questions was of great importance. In the Assembly Madison tried to indoctrinate the people of Virginia with his ideas concerning the Federal power. His bill to regulate trade in Virginia and to provide ports of entry led first to the conference between Virginia and Maryland with reference to trade on the Potomac and later to the Annapolis Convention which met in 1786 to consider the trade and commerce of the United States. This Convention at Annapolis urged upon the States the appointment of commissioners to meet in convention at Philadelphia «to devise such further government as shall appear to them necessary to render the Constitution of the Federal Government adequate to the exigencies of the Union.» The summoning of the Philadelphia Convention was largely due to the wise bills introduced by Madison in the Virginia Assembly and to his direction of public sentiment, and it was eminently fitting that he should be one of the delegates of the Virginia Commission at whose head was George Washington. Madison's views on government are clearly defined in his «outline system» which formed the basis of the Virginia plan proposed to the Convention. His system demanded that there should be a due supremacy of national authority without the exclusion of local authority, that the national authority should extend to the judiciary and to the militia; that the national legislature should be composed of two bodies, the larger elected for a short, the smaller for a longer term; that Congress should have certain coercive powers; that a national executive should be provided and that the basis of representation in Congress should be changed from States to population. The «Virginia plan» was the germ of the Constitution and Madison is rightly called the «Father of the Constitution.» His arguments in favor of the proposed government were exhaustive and convincing, and his private notes of the work of the convention and of his debates purchased from his widow and published by Congress form a valuable addition to our knowledge of this stormy period. While the Constitution was before the people for consideration Madison, Hamilton and Jay wrote a series of papers called in collected form 'The Federalist,' in which they discussed government in general, defined the character of the proposed union, met objections, and proved the advantages to be derived from effective central government. Madison was a member of the Virginia Convention which met to consider the ratification of the Constitution and by his keen analysis and clear cut argument contributed more than any other man to secure its adoption. His chief opponent was Patrick Henry; his ablest ally, John Marshall. Owing to Henry's antagonism, Madison was defeated as candidate for the Senate, but was elected as representative to Congress and took his seat in April 1789. During this session of Congress Hamilton and Madison, who had hitherto been at one in their efforts to centralize power, drifted apart, and Madison gradually began to endorse Jefferson's position as to certain inalienable States rights. There is no reason to accuse him of bad faith; his statesmanship was never overbold, and Hamilton's commercial system, his extensive financial schemes, especially the funding of the national debt and the assumption of State debts by the general government, gave so much power to Congress that Madison withdrew his support from the Secretary of the Treasury and vigorously opposed his measures. Although Madison had now definitely cast in his fortunes with the republican opposition his moderation and good sense enabled him to retain the friendship of most of his political opponents.

From 1793 to 1796 the country was greatly agitated over the relation of the United States toward France, and on the outbreak of war between France and England the President issued a neutrality proclamation to the great disgust of the French, who had expected active friendship from the United States. Although both countries interfered shamefully with American commerce, popular sentiment and the Republican party sided with France. In 1794 Madison, supported by Jefferson, introduced a bill demanding retaliatory measures against Great Britain, and a temporary embargo was laid on British commerce. The signing of the Jay treaty by the President was a signal for an outburst of popu-



JAMES MADISON,

4TH PRESIDENT OF THE UNITED STATES.

lar indignation, and Madison, as leader of the opposition in Congress, opposed the appropriation of money to carry out the terms of the treaty. In 1797 Madison retired and enjoyed for a short while the pleasures of private life. A year later he was aroused to activity by the passage of the unpopular Alien and Sedition Acts. The Virginia resolutions written by Madison denounced these laws and declared that in case of a dangerous exercise by the Federal government of powers not granted by the compact the States had the right to interfere. These resolutions still further emphasized the position of the Republican party and pledged it to the support of States rights. The year 1801 brought an overwhelming defeat to the Federalists; Jefferson was inaugurated President and Madison became Secretary of State. He was thoroughly in sympathy with the President's views and shared the popularity of that brilliant administration. The last years of Jefferson's second term were clouded by the insulting actions of England and France with reference to the American navy. The orders of the British and the decrees of Napoleon concerning the seizure of neutral vessels were ruining American commerce. Vessels were seized by the English and by the French, American seamen were impressed, and ports blockaded. Jefferson was opposed to war and in his efforts to coerce France and England by commercial restrictions he induced Congress to lay an embargo on British trade. Instead of injuring England this seriously crippled American commerce and was soon repealed. In this troubled condition of affairs Madison became President in 1809. Like Jefferson he was opposed to war and tried diplomacy. He attempted through Erskine, the British envoy, to have the British orders in Council withdrawn. Erskine agreed, but the British government repudiated the action of its envoy. Negotiations with another British Minister, James Jackson, were also fruitless. Continued insults were heaped upon American ships and men; the country demanded definite action against the aggressors; even the peace-loving President, weary of the offensive attitude of England, at last gave his consent to war. On the 18th of June 1812 war was declared and continued with varying success until the Peace of Ghent in 1814. After nearly three years of fighting, after ruinous loss of money and property, the country was practically just where it stood in 1812, «its boundary unchanged, its international rights still undefined, the people still divided.» Madison lacked vigor as a war president, nor had he sufficient determination to secure advantageous terms of peace. He was far greater as a framer of the Constitution than as an executive.

In 1817 Madison retired from office and settled on his estates of Montpelier. He had married in 1796 Mrs. Todd, afterward the celebrated Dolly Madison, and with her he enjoyed 20 peaceful years in his country home. He was interested in farming, he thought and wrote much on all topics of public interest. He discussed social and moral questions, slavery and education. «Education,» he maintained, «was the true foundation of civil liberty.» The last public appearance of the venerable statesman was in the Virginia Convention of 1829 which met to amend the State constitution. In character Madison was thoughtful, reserved, and cautious; in a time of hard drinkers he was notably abstemious. Moderation characterized all his habits. Dignified and kindly and an excellent conversationalist among those he knew well, he made and retained warm friends. His knowledge was profound and accurate, and he was considered an authority on all constitutional matters. His literary style was labored, but his arguments were keen, comprehensive and convincing.

Consult Lives of Madison by J. Q. Adams, Rives (1859-69); Gay (1884); also 'Letters and Writings of Madison' edited by Hunt (1900); Henry Adams, 'History of the United States from 1801 to 1817' (1889-90).

EMILIE MCVEA,
Of the University of Tennessee.

Madison, Lucy Foster, American novelist: b. Kirksville, Mo., 8 April 1865. She was educated at the High School in Louisiana, Mo., and was married in 1890 to W. S. Madison. She has published 'A Maid of the First Century' (1899); 'A Maid at King Alfred's Court' (1900); 'A Colonial Maid' (1902).

Madison, Ga., city, county-seat of Morgan County; on the Central of Georgia and the Georgia R.R.'s; about 70 miles east by south of Atlanta. It is situated in an agricultural region largely devoted to the cultivation of cotton. Its manufactures are cottonseed-oil, furniture, chairs, baled cotton, and dairy products. Madison has a large cotton trade. Pop. (1910) 2,412.

Madison, Ind., city, county-seat of Jefferson County; on the Ohio River, and on the Pittsburg, C., C. & St. L. railroad; about 85 miles southeast of Indianapolis. Steamers ply regularly connecting Madison with river ports on the Ohio and Mississippi rivers. The city was incorporated in 1824. Its principal industrial establishments are foundries and machine-shops, lumber yards, cotton and woolen mills, flour and lumber mills, and tanneries. Madison is the trade centre for quite an extent of territory in Ohio. Its educational institutions are public and parish schools and Saint Gabriel's Academy. The government is vested in a mayor, who holds office two years, and a council. The mayor appoints the city treasurer, city clerk, and the marshal. The council elects the other administrative officials. The waterworks plant is owned and operated by the city. Pop. (1910) 6,934.

Madison, N. J., borough, in Morris County; on the Delaware, L. & W. railroad; about 25 miles west of New York. It is a residential borough where a number of New York and Newark business men have their homes. It is one of the oldest places in the State, but was not incorporated until 1889. The principal industry is floriculture, especially the cultivation of roses. Madison is the seat of the Drew Theological Seminary; and Convent Station nearby is the seat of Saint Elizabeth's College. The park is well laid out and kept in good order. The borough is governed by a mayor and council. The term of office of the mayor is two years. The electric-light plant and the waterworks are owned and operated by the borough. Pop. (1910) 4,658.

Madison, S. Dak., city, county-seat of Lake County; on the Chicago, M. & St. P. railroad; about 40 miles northwest of Sioux Falls. The surrounding region has good farming land, wheat being the principal crop. Considerable attention is given to stock raising. The trade is chiefly in wheat and live-stock. Madison is the seat of a State Normal College which had in attendance in 1903 about 500 students. The electric-light plant and the waterworks are owned and operated by the city. Pop. 2,700.

Madison, Wis., city, capital of the State, county-seat of Dane County; on the Chicago, M. & St. P., the Illinois C., and the Chicago & N. W. R.R.'s; about 80 miles west of Milwaukee and 120 miles northwest of Chicago. It is between Lakes Monona and Mendota and near two other beautiful lakes, Kegonsa and Waubesa; it is 790 feet above the sea and 210 feet above Lake Michigan. The place was named in honor of James Madison. The first house was erected in 1837; and after Wisconsin, in 1836, had been organized as a Territory, this site was chosen for the capital, and work on the Capitol was begun in 1837. The place was chartered as a city in 1856.

Madison is situated in an agricultural region, and has commercial interests with a number of the larger cities, also with the small towns and villages in Dane and adjoining counties. Its chief manufactures are boots and shoes, agricultural implements and tools, flour, electrical machinery, wagons and carriages, blank books, and law books. It is a famous summer resort because of its climate, lakes, and scenery. The drives are remarkable,— about 30 miles of road in the vicinity are macadamized and kept in repair by popular subscription.

Madison is noted for its educational institutions, chief of which is the University of Wisconsin (q.v.). Opposite the university is the State Historical Society headquarters, the most beautiful building in the city. It is Ionic, of Indiana limestone, and the original cost was $700,000. It contains a valuable collection of historical mementoes and the famous reference library of the society, about 245,000 volumes. It is considered one of the best historical libraries in the United States. The libraries of the Wisconsin Academy of Sciences, Arts, and Letters and of the State University are also in this building. The city free public library is housed in a building of its own, a gift from Andrew Carnegie. Just outside the city limits is the Academy of the Sacred Heart (R. C.), a boarding schools for girls, a branch of the Battle Creek Sanitarium (q.v.), and the State Hospital for the Insane. The public and parish schools maintain a high standard. The State fish hatchery is near the city. Some of the other prominent buildings are the Capitol, already mentioned, which is surrounded by a beautiful park, the county court-house and jail, a government building, and twenty-two churches. It is a favorite educational convention city. The university summer school, held each year, attracts a number of students. It was for several years the home of the Columbian Catholic Summer School, which had in attendance people from all over the United States and Canada.

The government is vested in a mayor, whose term is two years, and a council. The city owns and operates the waterworks. Pop. (1910) 25,531.

George Raymer,
President Democrat Printing Company.

Madison River, a stream in Montana which has its rise in the Rocky Mountains, at an elevation of 8,300 feet. It flows north through Madison County and unites with the Jefferson Fork of the Missouri, at Three Forks. It flows through several picturesque valleys and deep cañons; its whole course is about 230 miles.

Madison Square Garden, a large building in New York city, occupying a block or square between Madison Avenue and 4th Street, and 25th and 26th Streets. It contains an amphitheatre seating 20,000 people, and is popular for horse shows, dog shows, circuses and political and religious meetings. The building also contains a theatre, concert hall, restaurant and roof-garden. It is built of buff brick and terra-cotta and is surmounted by a great tower 300 feet in height, modelled after the Giralda at Seville. It is one of the largest buildings in the city devoted to amusement.

Mad'isonville, Ky., city, county-seat of Hopkins County; on the Louisville & N. railroad; about 125 miles southwest of Louisville. It is in a rich agricultural region, tobacco being one of the principal productions. Coal and natural gas are in the near vicinity. The chief manufacturing establishments are a tobacco factory, tobacco stemmeries, lumber and planing mills, and flour mills. A coal mine nearby and the natural gas contribute to the prosperity of the city. Pop. (1910) 4,966.

Madness. See Insanity.

Madoc, măd'ŏk, Welsh prince, who, in consequence of some domestic dissensions, went to sea with 10 ships, and 300 men, in 1170, and discovered America. He made a second voyage to and from this unknown land, but finally was lost to the knowledge of his countrymen. The story is to be found in Lloyd and Powell's 'Cambria' (1584), and Hakluyt gives an account of the voyages in his collection. In Owen's 'British Remains' the legend, if it is anything more, is referred to. Later travelers have imagined that they had discovered traces of these early immigrants in different parts of the country, and we have had stories of White Indians and Welsh Indians, etc. See Humboldt's 'Personal Narrative,' Book IX., note A. Southey has made Madoc the subject of an epic poem. Stephens, in 'Madoc, an Essay on the Discovery of America in the 12th Century' (1893), proves that the story of Madoc is mere baseless fable.

Madonna, ma-dŏn'a (Italian), properly *my lady;* thus Petrarch often calls Laura *madonna;* but in art it is more particularly applied to the Virgin Mary. Many celebrated pictures are known under the name of Madonna, as the famous 'Madonna di Sisto' of Raphael in the gallery of Dresden.

Madoqua, măd'ō-kwa, a diminutive antelope (*Cephalolophus abyssinicus*), one of the duiker-boks (q.v.), common in Abyssinia. The fore-parts are rufous, but gray is the prevailing hue. The same name is sometimes applied to other very small north African antelopes, as the Beni Israel.

Madras, ma-drăs', British India, a province formerly a presidency, occupying the southern portion of the Indian peninsula. It stretches from the Bay of Bengal to the Arabian Sea. almost enclosing Travancore and Mysore, while a long, narrow portion extends along the west side of the Bay of Bengal till it meets the Bengal province about 70 miles from the mouth of the Mahánadi. It has a total area including native states of 150,798 square miles, the area of the native states being 9,475 square miles. Jaipur and Haidarabad bound it on the northwest, while the west borders for a short distance with Bombay. The chief mountain ranges are the Western Ghâts, the Eastern Ghâts, and the Nilgiri Mountains. The principal rivers are the Godáveri, and Kistna, with their tributaries; and the North Penner, South Penner, Palar, Kaveri, Coleroon, and Vaiga. There are no lakes of any importance, but many salt lagoons or inlets of the sea. Extensive forests yield teak, ebony, and other valuable timber trees. The wild animals are those common to other parts of India, the elephant, tiger, chetah, bear, bison, elk, spotted deer, antelope, jackal, wild hog, jungle sheep etc. The climate generally is reckoned the hottest in India, but differs widely in different localities according to elevation. The soil along the costs, particularly those of the Carnatic, is for the most part light and sandy; inland it consists of a decomposed syenite, impregnated with salt, which in dry weather covers the ground with a saline efflorescence. The district of Tanjore on the banks of the Coleroon is esteemed the granary of southern India. The principal vegetable productions are rice, wheat, barley, maize, and all the other grains common in India; sugarcane, areca, yam, plantain, tamarind, jack-fruit, mango, melons, cocoanuts, and a variety of other fruits; ginger, turmeric, pepper, tobacco, hemp, and cotton, for the growth of which it seems to be particularly well adapted. Tea is grown to some extent. Cotton cloth, muslins, carpets, and silks continue to be manufactured to a limited extent. The government of the presidency is vested in a governor subordinate to the Governor-general of India. The finances are in a healthy condition, the revenue usually exceeding the expenditure. At the head of the educational institutions is the Madras University, an examining body, granting degrees in arts, law, medicine, and engineering. There are various schools and colleges affiliated to the university.

The province is divided into 22 districts with a population (1891) 35,630,440; (1901) 38,208,609. The native feudatory states, Travancore, Cochin, Pudukota, Karnul, and Bellary, had a total population (1891) 3,700,622; (1901) 4,190,322. The languages are Tamil, Telugu (which are spoken by the great majority of the inhabitants), Canarese, and Malayalam, with some lesser dialects spoken by the more barbaric tribes on the mountains; Mahrathi and Gujerathi prevail in the northern and northwestern parts of the presidency; Uriya in the northeast; while Hindustani is the language spoken everywhere by the Mohammedans. Capital Madras (q.v.). See also INDIA.

Madras, British India, the capital of the province of Madras, on the Coromandel coast, lies on an open, sandy shore, exposed to the swell of the Bay of Bengal, which breaks upon the beach with great violence. A modern harbor formed by two piers obviates the former dangerous passage through the surf. The city is built on level ground and with its nine suburbs occupies 27 square miles. The chief commercial portion is Black Town, about a mile square, closely and irregularly built, containing the native and East Indian (or mixed) population, with a few European merchants and their families. On the south is the ancient Portuguese settlement Saint Thomé, with a Roman Catholic cathedral. One of the chief objects of interest is Fort St. George, which commands the Black Town and the roads, and may be considered the nucleus of the city. It was built in 1639, and is admirably situated for the defense of the town and shipping. It contains a church, the barracks, and an arsenal. The government-house, the Cathedral of St. George, and some of the other churches and public buildings, are handsome structures. Besides the University, the Presidential College, and a medical college, supported by government, there are large missionary institutions. The public park, containing a small zoological collection, is the chief recreation ground of the city. From the meridian of the observatory connected with the university all India takes its time. Madras is the chief seat of the provincial government offices, of the supreme court, a board of revenue, marine board, etc. Notwithstanding the disadvantages of its position it is a place of great trade, and a new harbor has greatly tended to increase traffic. The landing and shipping of goods is effected partly by lighters to the pier-head inside the harbor, and partly by the old *massula* or surf-boats, which land their cargoes on the beach. The imports are chiefly manufactured goods from the United Kingdom, especially cottons, wines, spirits, metals, stationery, etc. Among the principal exports are cotton, grain, indigo, coffee, tea, hides, oil-seeds, dye-stuffs, pepper, etc. The chief industries are connected with the preparation of goods for export, such as coffee pressing and cotton cleaning. Cotton-spinning factories have been established at Madras. The country at a short distance round the city, presents a remarkable contrast to its barren sandy shore, having the appearance of a fine park. The city has railway communication with all the principal places of India.

Madras was founded in 1639 by the English, who obtained the grant of a piece of ground for the erection of a town and fort from the Rajah of Chandgherry. It soon became a flourishing city and the chief station of the English on the Coromandel coast. In 1746 it was taken by the French, who kept it until 1749, when peace was made and the place was restored to the English. In 1758 it was again besieged by the French under the celebrated Lally, who was obliged to retreat after a siege of two months. Pop. about 512,000.

Madrazo, mä-drä'thō, **Raimundo de**, Spanish painter: b. Rome, Italy, 24 July 1841; d. Madrid, Spain, 11 June 1894. He studied art under his father, Federigo de Madrazo, and Léon Cogniet in Paris. He was very successful in portrait and genre and numbered many prominent Americans among his sitters. He was equally happy in pastel and oils, and his 'Fête during the Carnival' in Mrs. W. K. Vanderbilt's collection is as brilliant in conception as in technique.

Madre de Dios, mä'drĕ dĕ dē'oos, or **Amaru-Mayu**, Bolivia, a river, the chief affluent of the Beni, rising in the Carabaya Mountains, Peru, about 50 miles east of Cuzco, and after an easterly course, south by north, of 900 miles, chiefly through the Bolivian department of La Paz, uniting with the Beni at Rivera Alta, where it is 1,500 yards wide. It was explored in 1865 under the auspices of the London Geographical Society, and since 1881 has been the highway for the exploitation of the rubber forests along its course.

Mad'repore, a genus of coral-forming polyps (see CORAL) containing numerous species from the warmer and tropical seas of all parts of the earth. The true Madrepores increase by budding, the result being usually large branching colonies in which the coral between the cups containing the polyps is perforate and spiny. The different species frequently attain large dimensions and constitute one of the most important elements in the formation of coral reefs. The polyps have 12 septa and 12 tentacles, 6 being large, the other 6 smaller, while a peculiar feature is the presence of 6 U-shaped tubes connected with the œsophagus at either end. The term *Madreporaria* is sometimes used to include all polyps in which the parts are arranged in multiples of six, and which secrete coral on the external surface of the body.

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Madrid, ma-drĭd' (Sp. mä-drēd'), Spain, the capital of the kingdom and of the province of Madrid, a part of New Castile, situated near the centre of the country, on the left bank of the Manzanares, a sub-affluent of the Tagus. It is built on several low and irregular sandhills on a plateau 2,450 feet above sea-level, and is surrounded by a barren and extensive plain, treeless save in the vicinity of the city, and stretching northward to the snow-capped Sierra de Guadarrama. In winter the climate is exceedingly severe, and even in summer, when the heat is excessive, piercingly cold blasts descend from the mountains. The prevailing winds are the parching southeast *Solano,* and the icy north wind from the Guadarrama. The climate is described in a Spanish proverb as «three months of winter and nine months of hell.» The temperature ranges from 18° to 105° F.; is subject to frequent and sudden changes; and between the sunny and shady sides of a street the difference of temperature is sometimes as great as 20°. Madrid was until recently surrounded by a wall 20 feet high, pierced by 5 large and 11 small gates; of these gates 3 remain: the Puerta de Alcala on the east, the Puerta de Toledo on the south, and the Portillo de San Vicente on the west. The streets are distributed somewhat irregularly around the Puerta del Sol, which is in the centre of the capital. The principal streets are broad, long, and airy; and the houses are in general well constructed, substantial, and of good appearance.

In common with most European capitals, Madrid has undergone much modern improvement; the streets are traversed by electric and horse car lines; are lighted by gas and electricity; the telephone system is efficient; and sanitation has been much improved. The former abundant and pure water supply, is, however, inadequate to the demands of the growing population. Madrid has no edifices of great antiquity. The royal palace, situated at the western extremity of Madrid, is one of the most magnificent in the world. It occupies the site of the original Alcazar (castle) of the Moors, and is of enormous extent, being 470 feet each way, and 100 feet high. The architecture is a combination of Ionic and Doric. It contains a small but splendid Corinthian chapel, and a library of nearly 100,000 volumes, and the armory is one of the finest in the world. The chamber of deputies, which occupies an area of 42,700 square feet, has a hexastyle Corinthian portico on the grand façade, destined for the entrance of royalty on state occasions. On the two lateral façades are the entrances for the members. The Royal Exchange and the Bank of Spain are two modern imposing buildings. Madrid stands far behind many provincial towns as regards its churches, which are, with exception of a few attached to conventual establishments, poor, and of indifferent artistic merit. The church of the Almudena founded by King Alphonso XII. is in course of erection. The most important of the charitable institutions are the military hospital, an extensive building in the northwestern corner of the city; and the Hospicio of San Fernando, with schools for both sexes, the pupils being taught various handicrafts. At the southeastern corner of the city stands the general hospital, containing 1,200 beds. There are three foundling hospitals and six for orphans.

Madrid has 72 public squares, which are generally irregular both as regards their form and their edifices, as well as deficient in decorative monuments. Of these the Plaza Mayor is one of the largest and most regular. The Plaza de Oriente is adorned with 40 statues of Gothic kings, as well as those of the Asturias, Leon, Castile, and Aragon. In the centre is a fine equestrian statue of Philip IV. Among places of amusement the most popular is the Plaza de Toros (bull-ring), a building which is about 1,100 feet in circumference, and capable of containing 12,000 spectators. The Prado, a sort of wide boulevard, about 2 miles long, running north and south on the east of the city, is the chief promenade, and beyond it is the chief public park, including the Buen Retiro gardens, near which are the new handsome building for various ministerial departments, and the new station of the Southern Railway Company. The Royal Picture Gallery which stands in the Prado, contains more than 2,000 pictures, including a great many by all the best masters, especially those of Spain. There are also good pictures in the Academy of Fine Arts. The National Library, founded by Philip V., contains 500,000 volumes, is well managed, and is open to the public daily from 10 to 3. The Library of San Isidoro consists of 66,000 volumes. The University of Madrid, which arose out of that of Alcalà de Henares, founded in the 15th century, has an average attendance of 5,000 students. There are besides numerous other schools, academies, and colleges, public and private, including a normal school, a deaf and dumb institution, a normal school for the blind, a commercial school, schools for engineers, a conservatory of music, an academy for the fine arts with a gallery of 300 pictures, a veterinary college, an academy of medicine and surgery, etc. The famous monastical and palatial Escorial (q.v.) is 27 miles northwest of the city.

The industries have shown a remarkable development during the last decade, the chief manufactures being tobacco, leather goods, chocolate, beer, shoes, boots, plated ware, coaches, gloves, and fans. There is a royal carpet and tapestry factory in the Pacifico suburb. The commerce is important, as Madrid is the entrepôt for all the interior provinces. Retail business is mainly in the hands of foreigners, mostly French, but most of the wholesale trade is carried on by native houses. Madrid has railway communication with Paris and Lisbon, and the chief cities of the Peninsula.

Madrid in the Roman period probably was the insignificant hamlet Majoritum. Under the name Majorit it appears as a Moorish outpost of Toledo when captured in 932 by Ramiro II. of Leon. Henry IV. about 1461 made some additions to the older town, which was placed on the western eminence over the river. Madrid only began to be a place of importance under Charles V. Declared the seat of the court by Philip II. in 1560 the city rapidly grew up at the expense of the older and better situated capitals. It was the creation of a century, and its increase was very slow after the age of Philip IV. The gross mistake of a position which has no single advantage except the fancied geographical merit of being in the centre of Spain was soon felt, and on Philip II.'s death his son, in 1601, endeavored to move the court again to Valladolid, which, however, was found to be impracticable, such had been the creation of new interests during the outlay in the preceding reign. Madrid was entered by the French under Murat, 23 March 1808, but they were soon obliged to evacuate it. It was again held by the French from 1809 to 1812, when the Duke of Wellington entered it, and restored it to the Spaniards. After the deposition of the crown by King Amadeus in 1873, Madrid, along with the rest of Spain, suffered greatly from the anarchy caused by the struggles between the Republicans, Carlists, and Socialists. Pop. about 545,000.

Mad'rigal, a short lyric poem generally on amatory subjects. Those of Tasso represent the finest specimens of Italian poetry.

Madro'na, a large and ornamental tree of California (*Arbutus menziesii*), of the heath family, which often grows nearly 100 feet in height. It has a wide-spreading head, small evergreen leaves and the limbs and large parts of the trunk, where the thin outer bark easily peels off, are bright red. It grows in the foot hills, and up to a moderate elevation, but not naturally in the valleys. It is a near relative of the strawberry tree of Europe.

Mad'stone, a vegetable substance or stone which when applied to a wound caused by the bite of a mad dog is said to prevent hydrophobia. The most famous one in the United States is owned by the descendants of a family named Fred, in Virginia. This stone was brought over from Scotland in 1776. It is said to be the one spoken of by Sir Walter Scott in 'The Talisman' and has been religiously preserved as one of the most valuable relics of the age. It is about two inches long by one inch broad, and about half an inch thick, and is of a chocolate color. When applied to the wound it adheres till all the poison is absorbed, when it drops off. It is then soaked in warm milk or water for a time, and when removed the liquid is found to be full of a greenish-yellow scum. It is said that of the 130 cases in which it has been applied for the bite of a mad dog, none ever suffered from hydrophobia. There are said to be three authenticated madstones in the United States.

The belief in a madstone was common hundreds of years ago in the East, and travelers in India in 1677 and 1685 make mention of it. Tradition said it grew on the head of certain snakes. George F. Kunz, a New York expert in gems, identifies the madstone, or snakestone, of the East, with the stone known as tabersheer, which is a variety of opal found in the joints of the bamboo in Hindustan and Burma. This stone is formed of juice which by evaporation becomes mucilaginous, then a solid substance, and when placed in the mouth will adhere to the palate or cause water to boil. Sir David Brewster says it is found in the joints of diseased corn-stalks and is formed by sap depositing silica.

Madura, mä-doo'rä, southeastern Asia, an island of the Malay Archipelago, off the east end of Java, from which it is separated by the Strait of Madura. The island is about 105 miles long east to west, and 30 miles broad, with an area of 1,770 square miles. Madura forms one of the 17 Dutch residencies or provinces into which Java and Madura are divided, and is administered by a governor or resident. The Dutch first landed in Madura in 1747. It is undulating, but not mountainous, and though in general well watered, in some places, especially on the coast, there is a want of water, and the soil is unfertile. The interior, however, is fertile, though not so productive as Java. Maize, cocoanuts, tobacco, Jamaica pepper, tamarinds, and salt are the chief products; stock-raising is an important industry; and the exports include also birds'-nests, country cloths, white and striped, poppy-oil, rattan-mats, and baskets, etc. The chief towns are Bangkalang, Pamekasan (the capital), and Sumanap. Pop. about 1,800,000, of whom 4,252 were Chinese, 558 Europeans and the rest natives.

Madura, southern India, the capital of a district of Madras, 344 miles by rail southwest of Madras. It was the capital of the ancient Pandhyan kingdom, for over 2,000 years was the political and religious capital of southern India, and is noted for its interesting architectural monuments, chief of which is the Temple of Minarchi, dating from almost prehistoric times, restored and added to by Tirumulla Nayak (1622–62). It ranks fourth among the seven strongholds of Hinduism, and occupies a parallelogram of 56,000 square feet containing 50 buildings. Madura is the seat of Catholic and American Protestant and other missions, and has several high-grade educational institutions.

Madvig, mäd'vĭg, **Johan Nikolai,** Danish scholar: b. Svanike, island of Bornholm, 7 Aug. 1804; d. Copenhagen 13 Dec. 1886. Educated at Frederiksborg and Copenhagen, he was from 1829 till 1879 professor of Latin in the University of Copenhagen. He took a profound interest in the politics of his country, and from 1848 till 1851 was minister of education and religion. He is best known by critical editions of Latin classics and by his Latin grammar translated into English and most European tongues. His chief works are: 'Emendationes in Ciceronis Libros Philosophicos' (1828); 'Cicero's De Finibus Bonorum et Malorum' (1839, amended 1876); 'Ciceronis Orationes Selectæ Duodecim' (1830); 'Cicero's Cato Major and Lælius' (1835); 'Opuscula Academica' (1834-42; new edition 1887); 'Emendationes Livianæ' (1860); 'Livii Opera' (with Ussing, 1861-6); 'Adversaria Critica' (1871-84); 'Latin Grammar' (1841); 'Greek Syntax' (1846); 'Constitution and Administration of the Roman State' (1881-2); 'Autobiography' (1887).

Mæander, mē-ăn'dėr, now **Mendere,** Asiatic Turkey, a river which rises in Phrygia not far from Celænæ. It forms the boundary between Caria and Lydia, and flows into the Icarian Sea between Priene and Myus, opposite Miletus. It was celebrated among the ancients for its winding course, and gave its name to the intertwined purple borders on mantles and other dresses, as well as upon urns and vases.

Mæandrina, mē-ăn-drī'na, one of several genera of brain corals, so called from the elongate and meandering cups containing the polyps, which give a spherical mass of these corals an appearance strikingly like the human brain with its convolutions. This appearance is due to the fact that the polyps in their growth do not completely divide, but stretch out into long bands, frequently branching, with many mouths and tentacles, and a common body and digestive cavity. Brain corals occur in all tropical seas, several species being found in Florida and the West Indies. Their solid masses make them important factors in the formation of coral reefs.

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Mæcenas, mē-sē'nas, **Gaius Cilnius,** Roman nobleman: b. between 73 and 63 B.C.; d. 8 B.C. He was the friend of Augustus, and patron of Virgil and Horace. Though it is unknown where he received his education, it must have been a good one, for he was intimate with the literatures both of Greece and Rome, and was himself an occasional writer in prose and verse. We first hear of him authentically (40 B.C.) as negotiating a marriage between Octavianus and Scribonia: and in the same year he contributed materially to bring about the Peace of Brundisium, by which Cæsar and Antony were reconciled. Two years later he was again employed in reconciling these self-willed potentates; and 36 B.C. he was twice despatched by Octavianus from Sicily to Rome to quell disturbances which had broken out there. He was for these services entrusted with the administration not only of Rome, but of all Italy. His palatial residence and gardens on the Esquiline were the rendezvous of all the *literati* of Rome, and of numerous parasites. But those admitted to his intimacy were the greatest geniuses and scholars of Rome, among them being Virgil and Horace. To the intercession of Mæcenas, Virgil was indebted for the recovery of his farm, and Horace also owed to him many favors.

Maelar, Lake of. See Mälar.

Maelstrom, māl'strŏm, or **Moskoe-strom,** Norway, a rapid current or tidal whirlpool off the northwest coast immediately southwest of Moskenesoe, the southernmost of the Lofoten Isles. The current runs with the tides alternately, six hours from north to south and six hours from south to north, producing immense whirls. The depth of the water around, supposed at one time to be too great to admit of soundings, has been ascertained not to exceed 20 fathoms, with a bottom of rocks and white sand. Immediately to the west the soundings are from 100 to 200 fathoms. The whirlpool, idealized by mediæval and later writers including Edgar Allan Poe, is greatest at high or low water. When the wind is northwest and opposed to the reflux of the waves it attains its greatest fury, and becomes extremely dangerous, but in ordinary circumstances it may be traversed without difficulty.

Maestricht, mäs'trĭht, Netherlands, the capital of the province of Limburg, on the left bank of the Maas, at the confluence of the Geer, lies on the Belgian frontier, 56 miles east of Brussels, and 52 miles west by south of Cologne. Among the chief buildings are the church of St. Servais, partly Romanesque and partly Gothic, dating from the 10th century; the town-hall; the courts and general prison, and the arsenal. The fortifications were dismantled between 1871 and 1878; it is, however, still a considerable garrison town. Maestricht carries on an active transit trade with Belgium, and has manufactures of glass and earthenware, firearms, shot, cloth, and paper-hangings; also iron-foundries, beet-root sugar refineries, tobacco and cigar factories, tan-pits, distilleries, and breweries, the latter producing very noted beer. About three miles from the town is the Pietersberg (Peter's Hill), on which stands the fort of St. Pierre, and under which are extensive subterranean quarries, supposed to have been excavated by the Romans. Maestricht was besieged and taken, and 8,000 of its inhabitants were massacred in 1579, by the Spaniards, under the Duke of Parma; in 1673 it was taken by Louis XIV., and again by the French in 1748 and 1794. William III. of England failed to take it; and in 1830 its garrison resisted successfully the attacks of insurgent Belgians.

Maestricht Beds, in geology, a series of calcareous beds 100 feet thick, on the banks of the Meuse, near the Dutch city of Maestricht. The Maestricht calcareous rock contains *Belemnitella, mucronata, Pecten quadricostatus,* etc., also the genera *Braculites, Hamites,* etc., which are only Mesozoic. It is a connecting link between the Secondary and the Tertiary rocks, but in all essential respects belongs to the former.

Maeterlinck, mĕt'ėr-lĭnk, **Maurice** (Gallicized from the original Mooris Mäterlinck). Belgian author: b. Ghent 29 Aug. 1862. He was educated in a Jesuit school in Belgium, then studied law, was admitted to the bar in 1887, but was from the first more interested in letters, and in 1896 settled in Paris as an author. His work may be divided into three parts,— his lyric verse, his dramas, and his philosophical essays. Of the first the two volumes 'Serres Chaudes' (1889), and 'Douze Chansons' (1896) are representative. Maeterlinck's verse is imaginative, but lacks in any strong degree the melodic quality. His dramas are: 'La Princesse Maleine' (1889); 'Les Aveugles' (1890); 'L'Intruse' (1890); 'Les Sept Princesses' (1891); 'Pélleas et Mélisande' (1892); 'Alladine et Palamides' (1894); 'La

Mort de Tintagiles’ (1894); ‘Aglavaine et Sélysette’ (1896); and ‘Monna Vanna’ (1902). Several of these were translated into English by Richard Hovey (q.v.), and ‘Monna Vanna’ was rendered by Alexis I. du P. Coleman. The dramas are Maeterlinck's most striking work. Their eery symbolism can hardly be explained, but must be appreciated at first hand. Though they inaugurated a new theatric school — the ‘Drame Intime’ — they are properly reading plays, and lose their mystery and impressiveness in presentation. ‘Pélleas et Mélisande’ was given in the United States by Mrs. Patrick Campbell. To many the essays are the most interesting things that Maeterlinck has done. The volumes are ‘Le Trésor des Humbles’ (1896); ‘La Lagesse et la Destinée’ (1898), and ‘La Vie des Abeilles’ (1902). The first is somewhat mystical, all are somewhat diffuse; but he has been called by virtue of them a true successor of Swedenborg and Böhme.

Mæviad and Baviad. See BAVIAD.

Mafeking, mä-fā-kĭng′ or măf′ĕ-king, Cape Colony, a former Bechuana settlement, now a town, the administrative seat of the Bechuanaland protectorate, close to the borders of the Transvaal, 870 miles by rail northeast of Cape Town and about 200 miles west-southwest of Pretoria. The town stands near the upper Malopo River, and contains several substantial buildings, including a Masonic temple, a town-hall and a hospital, and there is a good water-supply, a swimming-bath, and a race-course. Mafeking sustained a protracted siege during the South African War of 1899–1901. It was isolated in October of the former year, and was brilliantly defended by a small force under Colonel (now General) Baden-Powell, until relieved by Colonel Mahon in May 1901.

Maf′fitt, John Newland, American clergyman: b. Dublin, Ireland, 28 Dec. 1794; d. Mobile, Ala., 28 May 1850. He was a Wesleyan preacher in Ireland and in 1819 emigrated to the United States, where he became a member of the New England Methodist Episcopal conference. He founded the ‘Western Methodist’ in Nashville in 1833 and conducted revivalist meetings throughout the South and West. In 1837 he became professor of elocution and belles-lettres at La Grange College, Louisiana, and in 1841 he was elected chaplain to Congress. He published several religious works, also an autobiography.

Maffitt, John Newland, American naval officer: b. at sea 1819; d. 1886. He enlisted in the United States navy in 1832 and in 1861 entered the service of the Confederacy where he took rank as commodore. In command of the Florida he rendered himself valuable to the Confederate cause, taking many prizes and damaging seriously United States commerce. Owing to ill-health he resigned before the end of the War.

Mafia, mä-fē′ä, a Sicilian secret society similar to the Camorra, which has long existed in Naples, but much more powerful. The Mafia is essentially a form of organized lawlessness, but its organization is sufficiently elastic to baffle all the attempts of the government to suppress it. It is generally said to have had its origin in the *compagni d'armi*, a kind of police organized in Sicily early in the 19th century and dissolved by Garibaldi in 1860. Its members, who are required to prove their daring in a knife duel, are bound never to carry their suits to the regular courts or to give evidence before them. Murder and robbery are discountenanced under ordinary circumstances, but they are resorted to without hesitation in the case of informers or specially obnoxious persons. Blackmail is levied from land-owners, who are required to employ only *mafiosi* in certain occupations. Criminals are protected and elections controlled by this infamous society, whose authority is greater than that of the law among the lower classes in Sicily. The Chinese highbinder societies are similar to the Mafia. Within recent years these murderous organizations have secured a footing in the United States, and murders directly chargeable to the Mafia have been committed in New York, New Orleans, Chicago, and other large cities.

Magalhães, Domingos José Gonçalves de, dō-mēn′gō hō-sā′ gôn-säl′vĕs dā mä-gäl-yä′-ĕns, VISCOUNT D'ARAGUAYA, Brazilian poet and diplomat: b. Rio de Janeiro 13 Aug. 1811; d. Rome, Italy, 10 July 1882. He was admitted to the bar, but entered the Brazilian diplomatic service in 1836, and was minister at Vienna, at Washington (1868–72), and at Rome. He is rated among the foremost of Brazilian poets. His best-known work is the ‘Confederacão dos Tamoyos’ (1857), based on historical events in early Brazil. Among his other volumes are ‘Mysterios’ (1858) and ‘Urania’ (1862); and he wrote also philosophical treatises and successful tragedies. A collected edition of his works was published in 1876.

Magalhães, Fernão de. See MAGELLAN, FERDINAND.

Magallanes, mä-gäl-yä′nes, Chile, a territory lying south of the Department of Chiloe, and includes the many islands, large and small, along the western and southern coasts of Chile. Its entire area is over 80,000 square miles. Among the more prominent islands in the territory are the Wellington group, Hanover group, Queen Adelaide Archipelago, Madre de Dios and a part of Tierra del Fuego. The mainland is a narrow strip of mountainous sea-coast. Pop. about 6,000.

Mag′dala, Abyssinia, a town and fortress on a plateau nearly 9,000 feet above the level of the sea, about 120 miles southeast of Gondar, on the left bank of the Bashilo, an affluent of the Blue Nile. A wall of columnar basalt, varying from 30 to 700 feet high, surrounds it on every side. Magdala acquired notoriety from its having been stormed in 1868, by the British troops under Sir Robert Napier, afterward Lord Napier of Magdala. (See ABYSSINIA.) The Abyssinians had deemed their fortress impregnable.

Magdalen, măg′dạ-lĕn, a name applied to one of the Marys in the Gospels, derived from her place of birth, or former residence, in order to distinguish her from other women of that name (Matt. xxvii. 56, 61; Mark xv. 40, 47; Luke vi. 2; John xix. 25).

Magdalen (măg′dạ-lĕn or môd′lĭn) **College,** Oxford, England, originated in Magdalen Hall, founded in 1448 by William Patten, commonly called William of Waynflete, from the place of his birth, Bishop of Winchester and Lord High-chancellor of England, who 10 years later added the College of Saint Mary Magdalen. In some respects Magdalen is the most noteworthy college of the university. Five of the fellowships are attached to five Waynflete professorships, of moral philosophy, chemistry, mineralogy, physiology, and pure mathematics, established in lieu of the three former lectureships of divinity, moral philosophy, and natural philosophy. There is also a professorship of botany. The buildings are noted for their beauty and occupy extensive grounds. Among Magdalen's celebrated alumni are Addison, Foxe, Gibbon, Hampden, Lily, Lyly, Philpotts, Selborne, Tyndale, and Wolsey.

Magdalen (măg'dạ-lĕn) **Islands,** Quebec, Canada, near the centre of the Gulf of St. Lawrence, 54 miles northwest of Cape Breton, Nova Scotia, and 100 miles southwest of Newfoundland. Amherst, Alright, Coffin, Wolf, Grindstone, Deadman, Entry, and Byron islands compose the group which are politically attached to the district of Gaspé, Quebec. The inhabitants exist chiefly by the fisheries of the adjacent waters; gypsum which is found in veins and hollows, and grindstones from Grindstone island, are exported. House Harbor on Alright Island, and Amherst where there is a customhouse, are the chief settlements. Pop. 3,200.

Magdalena, mäg-dä-lä'nä, a river of Colombia, South America, which has its rise in the Andes Mountains in the southwestern part of Colombia, and flows north to the Caribbean Sea. A short distance from the sea, at the city of Barranquilla, the river divides and discharges its waters through two channels. It is about 1,000 miles in length. It is navigable for ocean steamers to Barranquilla, and for small steamers to Honda, about 600 miles from its mouth. Navigation is obstructed at Honda by a series of falls and rapids; and a railroad, about 22 miles long has been built along the river to a point above the rapids, from which the river is navigable up the stream for about 200 miles to Neiva. Magdalena River is the principal route from the sea to the interior of the country. Bogota (q.v.), the capital, is at present (1910) largely dependent upon this river for means of communication with places on the coast. The largest tributary is Cauca, whose source is near that of the Magdalena, and part of its course is almost parallel with the main river. Short railroads connect some of the interior towns with the river and its tributaries.

Magdalena (măg-dạ-lē'nạ) **Bay,** an inlet on the west coast of Lower California, in Mexico, one of the best harbors on the Pacific coast. The inlet or arm of the sea is about 40 miles long and is protected by a long low sand-bar. A town of the same name is situated on the harbor.

Magdalene (măg'dạ-lĕn) **College, Cambridge,** England, was founded in 1519 by Thomas, Baron Audley of Walden. There are seven open fellowships on the foundation, and 12 open scholarships. There are also several exhibitions. The annual Pepysian benefaction, value £50, is in the master's gift, and is usually bestowed upon poor and deserving students. The buildings consist of two courts, restored and altered in 1880, a chapel and hall dating from the 15th century, and the Pepysian Library, built in 1688.

Magdeburg, mäg'dĕ-boorg, **Germany, city,** capital of the Prussian province of Saxony; on the Elbe, about 80 miles southwest of Berlin. The manufacturing and trade of Magdeburg are extensive, and its facilities for transportation by water and railroad are excellent. Among its industrial establishments are the Gruson Works, noted for their connection with the Krupp Works, the beet-sugar factories, and a number of other establishments. It has a large number of excellent schools, gymnasia, a pedagogical seminary, art schools, industrial schools, etc. Magdeburg is a place of great antiquity, being a trading centre in the 9th century. It early distinguished itself in the Reformation. During the Thirty Years' war the town was besieged, stormed, and sacked by Tilly, when 20,000 persons are said to have been murdered. Pop. about 230,000.

Consult: Wolter, 'Geschichte der Stadt Magdeburg'; Dodge, 'Gustavus Adolphus.'

Magdeburg Hemispheres, a celebrated invention of two hollow hemispheres, made of copper or brass, with their edges accurately fitted to each other, and one of them furnished with a stopcock. When the edges are rubbed over with grease, pressed tightly together, and the globe thus formed exhausted of air through the cock, the hemispheres, which fell asunder before exhaustion, are now pressed together with immense force. If they are one foot in diameter, they will, after exhaustion, be pressed together with a force of nearly a ton. This experiment was first performed by Otto von Guericke of Magdeburg, in 1650, at the imperial diet at Ratisbon, to the astonishment of the Emperor Ferdinand III. and the royal family.

Magellan, ma-jĕl'ạn, **Ferdinand** (in Portuguese Fernão de Magalhães or Magalhaens), Portuguese navigator: b. probably at Villa de Sabroza, Trazos-Montes, about 1470; d. Philippine Islands 27 April 1521. He served in the Indies with distinction, especially at Malacca, and in 1514 saw service in Morocco. In resentment at his treatment by the king, who had not, he thought, duly rewarded his services, he, with Ruy Falero, a geographer and astronomer, renounced his nationality and offered his services to Spain. Magellan's proposal to seek a western route to the Moluccas was accepted by Charles V., and on 20 Sept. 1519, he set sail from San Lucar de Barrameda in command of five vessels. He passed through the strait which bears his name (see Magellan, Strait of), and on 28 Nov. 1520, reached the great ocean which he called the Pacific from its calmness. With his three remaining vessels he sailed by way of the Ladrones Islands to the Philippines, discovering Samar on 16 March 1521. He caused the king of Zebu to swear allegiance to Spain, but was killed in a fight with the natives of Matan. His vessel, the Victoria, under Sebastian del Cano, completed this, the first circumnavigation of the globe. The chief authority for the voyage is a work by Pigafetta, an Italian who accompanied Magellan.

Consult: Lord Stanley, 'The First Voyage Round the World' (1875); and Guillemard, 'Ferdinand Magellan' (1891).

Magellan, Strait of, the channel which separates the continent of South America from Tierra del Fuego and thus forms a communication between the South Atlantic and the South

LAKE MAGGIORE.

Pacific Oceans. It is upward of 360 miles long, and is of difficult navigation. Its breadth varies exceedingly, the maximum being somewhat over 70 miles. There are a number of bays along the shore and at the southwestern end, a group of several small islands. Punta Arenas is the best harbor. The strait was discovered in 1520 by Fernando Magalhães or Magellan.

Magellan'ic Clouds, in astronomy, called the Nubeculæ, Major and Minor, from their cloud-like appearance, two oval masses of light in the southern hemisphere near the pole; often both visible to the naked eye. Sir J. Herschel describes them as consisting of swarms of stars, clusters, and nebulæ of every description.

Magendie, François, frän-swä mä-zhōn-dē, French physician and physiologist: b. Bordeaux 15 Oct. 1783; d. Paris 8 Oct. 1855. He was the pupil of the celebrated surgeon Boyer, and at 20 was appointed successively *aide d'anatomie* in the faculty of medicine, and demonstrator. He, however, subsequently devoted himself principally to the practice of medicine, was in 1819 elected a member of the Academy of Sciences, and in 1831 succeeded Récamier in the chair of anatomy in the College of France, which he retained until his death. As an experimenter in physiology he occupied a high position, and his experiments on living animals were at one time so numerous and involved so much suffering to the animals, that the French government deemed it necessary to interfere. The results obtained, however, were of great importance, if they do not absolve him from the charge of cruelty. Among them may be named an original demonstration that the two roots of the spinal nerves are devoted to two separate functions; that the veins are organs of absorption; that strychnine acts upon the spinal cord and contracts by tetanic spasm the nerves of respiration, thus inducing asphyxia; that food destitute of nitrogen is not nutritious; and that prussic acid is a valuable remedy in certain forms of cough arising from irritation in the lungs. He was a prolific author of medical works, the most important of which are: 'Formulaire pour la Préparation et Emploi de plusieurs nouveaux Médicaments' (1821), containing an account of the effects of certain plants then recently introduced into the materia medica, and which has been translated into all the languages of Europe; 'Précis élémentaire de Physiologie' (1816–17), for many years an important manual for students; 'Leçons sur les Phénomènes physiques de la Vie' (1836–42); 'Leçons sur les Fonctions et les Maladies du Système nerveux' (1839); 'Leçons sur le Sang' (1839).

Magenta, mä-jĕn'tä, Italy, town in the province of Milan, 14 miles east of Milan, is situated in a grape region, in which the cultivation of grapes and mulberries and the manufacture of wine are the principal industries. Considerable raw silk is exported. It was the scene of a famous engagement 4 June 1859 between the French and Sardinian forces, and the Austrians. The Austrians were defeated, largely through the superior tactics of General MacMahon (q.v.) of the French army. Pop. about 8,500.

Magenta, or **Aniline Red,** a coal-tar dye, which consists of a mixture of the hydrochlorides of rosaniline and para-rosaniline. (See ROSANILINE.) It may be prepared from aniline oil by digesting the aniline with arsenic acid, or with nitrobenzene and ferrous chloride. When the oxidation is complete, the rosaniline hydrochloride is precipitated by the addition of common salt in large excess, the hydrochloride being formed by double decomposition, and thrown down because it is but sparingly soluble in salt solutions. Consult Benedikt, 'Chemistry of the Coal-Tar Colors.')

Maggiore, mäd'jō'rĕ, **Lake,** one of the largest lakes in Italy, the *Lacus Verbanus* of the Romans, is situated for the most part in Italy, but also partly in the Swiss canton of Ticino. It is 39 miles in length, and varies in breadth from one half mile to five and one half miles. It is 646 feet above the level of the sea and has a maximum depth of 1,158 feet. The river Ticino flows through it. In a southwestern expansion of the lake are the Borromean Isles (q.v.). On the north and west it is surrounded by granitic mountains, 7,000 feet high, on the south and east by vineyard-covered hills. On its shore are a large number of villages and cities noted for beautiful scenery and historic connections.

Maggot, the larva of a fly. (See FLIES).

Magi, mā'jī, an Accadian term recently brought to light by Assyrian scholars; Accadian being the language of the people of Babylon and Media. The word signifies «august,» «reverend,» and was the title of their learned and priestly caste. The Semitic nations afterward dominant in Babylonia and Assyria adopted the learning and many of the religious observances of the early inhabitants, as also the name for the learned caste; and out of the Semitic form the Greeks made *magos*. Under the Persian empire the magi were not only the «keepers of the sacred things, the learned of the people, the philosophers and servants of God,» but also diviners and mantics, augurs and astrologers. They were held in the highest reverence, and no transaction of importance took place without or against their advice. Hence their almost unbounded influence in both private and public life. Apart from the education of the young princes being in their hands, they were the constant companions of the ruling monarch. Zoroaster, in the course of his great religious reform, reorganized the body of the magi, chiefly by reinforcing the ancient laws as to their manner and mode of life, which was to be one of the simplest and severest, befitting their sacred station, but which had become one of luxury and indolence, and by re-instituting the original distinction of the three classes of *herbeds* («disciples»), *mobeds* («masters»), and *destur mobeds* («complete masters»). The food, especially of the lower class, was to consist only of flour and vegetables; they wore white garments, slept on the ground, and were altogether subjected to the most rigorous discipline. The initiation consisted of the most awful and mysterious ceremonies, and was preceded by purifications of several months' duration. Gradually, however, their influence, which was all-powerful during the epoch of the Sassanian kings of Persia, began to wane, and, from being the highest caste, they fell to the rank of wandering jugglers, fortune-tellers, and quacks, and gave their name to sleight-of-hand and conjuring tricks. But the name seems to have been also current as a generic term for astrologers in the East, as is evidenced by the New Testament narrative of the homage of the Magi to the Infant Christ. According to the narrative (Matt. ii. 1–12) the three wise men came from the East to Jerusalem, led by a star, which at length guided them safely to the place of the Nativity at Bethlehem, where they offered their gifts of gold, frankincense, and myrrh. As the «Three Kings» their names became celebrated in the Middle Ages, and Bede distinguishes them as Kaspar, Melchior, and Balthasar. See also Parsees; Zoroaster.

Magic, or **Black Art**, was formerly the means of producing supernatural effects with the assistance of evil spirits. Supernatural effects were at an early period naturally associated with the exercise of the healing art. In the rudest stages of society this was confined to the women, and naturally arrived at the dignity of a profession in the hands of the older, whom experience had gifted with superior skill. As their art was for the most part a mystery to themselves, they gradually came to be regarded as objects of fear as much as of hope, and magic medicines became synonymous with poison. The sorceress, poisoner, and witch were in time reckoned identical. (See Witchcraft.) Media, Persia, and the neighboring countries, famous for their knowledge of astronomy and astrology, are described as the chief seats of the ancient Magi, whose doctrine seems to be, in part, of great antiquity. This doctrine represented opposition or strife as the parent and original cause of all things. After the opposition between light and darkness, Ormuzd and Ahriman, was established, the whole series of finite beings, the whole sensual world, proceeded from this constant struggle of light and darkness, good and evil. The change of day and night, light and darkness, the whole series of ages, time itself, is only a consequence of this struggle, in which sometimes light, sometimes darkness, appears victorious, until finally light shall conquer for ever. If all finite things stand under the influence of preserving and destroying powers in nature, it is clear that he who could master these powers could dispose at his pleasure of the things subject to them; and the doctrine of the Magians was that by prayer and a true knowledge of those laws of opposition, love and hatred, light and darkness, such power could be obtained; and that thus also it was possible to pry into futurity. But it was believed that as the world became sinful the light of the ancient doctrine of the Magi was obscured, and those who bore the name became at last only evil-disposed sorcerers. One important branch of their art was now the excitement of love by potions and enchantments. Their love-potions consisted partly of ingredients which are still known to the physicians as stimulants, partly of parts of animals who had died longing for food or air, or the saliva of hungry dogs, and other still more disgusting substances. Magic at this period also occupied itself with fortune-telling, calling up the dead and bewitching by the look — a superstition which we find existing in the processes against witches in modern times. It can hardly be doubted that the art of the ancient magicians was founded to a considerable degree upon a knowledge of the powers of nature superior to that of the general public. At one time magic was greatly studied in Europe, and many distinguished names are found among its students and professors. The most famous of these are Albertus Magnus, Roger Bacon, Cornelius Agrippa, Michael Nostradamus, John Dee, William Lilly, etc. Consult: Ennemoser, 'History of Magic'; Scott, 'Demonology and Witchcraft'; Mackay, 'Memoirs of Extraordinary Popular Delusions'; Regnault, 'La Sorcellerie, ses Rapports avec les Sciences biologiques' (1897); Lehmann, 'Aberglaube und Zauberei' (1898).

Magic Lantern, an optical instrument for the enlarged representation of small figures. The instrument consists of a lantern, generally of tin, and cubical in form, having in the interior a powerful Argand lamp, the pencils of light issuing from which pass through a convex lens. It is most commonly used as a toy, but it is also valuable for the purposes of science in enlarging astronomical and other diagrams to illustrate lectures, so that they may be seen by an audience. The principle of its construction is very simple. A lamp is placed within the closed lantern with its burner in the focus of a concave mirror, the reflected light from which passes through a horizontal tube on a level with the flame. This tube contains two lenses, the one a hemispherical illuminating lens, of short focus, to condense a strong light on the picture, and the other a double convex lens, which receives the rays after they have passed through the picture, and throws them on the screen. The picture is inserted through a transverse slit into the tube between the lenses. That the representation may appear erect the picture must be inserted into the tube in an inverted position. The screen must not be too far removed from the lantern, otherwise the image will become indistinct and distorted. The tube is made to pull out, so that the distance of the lens from the slider being capable of being increased or diminished, an image of any moderate size, larger or smaller, may be formed, by increasing or diminishing the distance between the lantern and the screen.

Magic Square, in mathematics, a term applied to a series of numbers in arithmetical progression, arranged in the equal cells of a square, in such a manner that the vertical, horizontal, and diagonal columns shall give the same sums. The methods given for constructing them are divided into different rules, but no general method has yet been found that shall apply to all cases. The first sixteen numbers are arranged as a magic square in the annexed table:

1	16	11	6
13	4	7	10
8	9	14	3
12	5	2	15

There are said to be 880 methods of making these magical squares, and only those squares are included which are essentially different.

«Magic circles,» «cubes,» «cylinders,» etc., are also constructed.

Maginn, ma-gĭn', **William**, Irish author: b. Cork, Ireland, 11 Nov. 1793; d. Walton-on-Thames, 20 Aug. 1842. He was graduated from Trinity College, Dublin, in 1811, and was for some years a school-master. In 1819 he became a contributor to ‹Blackwood's Magazine› and was in turn Paris correspondent of the ‹Representative,› junior editor of the ‹Standard,› and one of the founders of ‹Fraser's Magazine,› his contributions to which made it famous. He was a man of superb classical education, excelled as a critic, and his literary work abounded in rich fancy and the genuine Irish wit. Unfortunately he had no financial ability and he died in extreme poverty notwithstanding the large sums his pen had earned. His collected works were published in 5 vols. in 1855-7.

Magistrate. See COURT.

Magliabecchi, Antonio, ăn-to'nē-ō mäl-yä-bĕk'ē, Italian bibliographer: b. Florence 28 Oct. 1633; d. there 4 July 1714. In the early part of his life he was engaged in the employment of a goldsmith, which he relinquished to devote himself to literary pursuits. Through unremitting application he acquired a multifarious stock of erudition, which made him the wonder of his age. Duke Cosmo III. made Magliabecchi keeper of the library which he had collected, and gave him free access to the Laurentian Library and the oriental MSS., and of the latter collection he published a catalogue. He left no literary work, but freely afforded information to authors who sought his assistance in their own undertakings, his prodigious memory enabling him to furnish the exact reference to any page or paragraph of the numberless volumes he had read. He left his valuable private library of 30,000 volumes to his native city where it now forms part of the National Library.

Magna Charta, măg'nạ kär'tạ, or **Great Charter of Liberties**, a famous document extorted from King John of England by the confederated barons in 1215. The barons who with their followers composed «the Army of God and the Holy Church» were the whole nobility of England; their followers comprehended all the yeomanry and free peasantry, and the accession of the capital was a pledge of the adherence of the citizens and burgesses. John had been obliged to yield to this general union, and in June both parties encamped on the plain called Runnymede, between Windsor and Staines, on the banks of the Thames, and conferences were opened between the king and his barons. The preliminaries being agreed on, the barons presented heads of their grievances and means of redress, in the nature of the bills now offered by both houses for the royal assent. The king, according to the custom which then and long after prevailed, directed that the articles should be reduced to the form of a charter, in which state it issued as a royal grant. The charter was signed on 15 June. Copies were immediately sent to every county or diocese, and ordered to be read publicly twice a year. To secure the execution of the charter John was compelled to surrender the city and Tower of London, to be held by the barons till 15 August, or until he had completely executed the charter. Many parts of the charter were pointed against the abuses of the power of the king as lord paramount; the tyrannical exercise of the provisions of the forest laws was checked, and many grievances incident to feudal tenures were mitigated or abolished. But beside these provisions it contains many for the benefit of the people at large, and a few maxims of just government, applicable to all places and times, of which it is hardly possible to overrate the importance of the first promulgation by the supreme authority. The 39th article contains the celebrated clause which forbids arbitrary imprisonment and punishment without lawful trial. This article contains the writ of *habeas corpus* and the trial by jury, the most effectual securities against oppression which the wisdom of man has devised, and the principle that justice is the debt of every government, which cannot be paid without rendering law cheap, prompt, and equal. The provision which directs that the supreme civil court shall be stationary, instead of following the king's person, was an important safeguard of the regularity, accessibility, independence and dignity of public justice in Great Britain. The Great Charter was frequently confirmed: four times by Henry III., and no fewer than 13 times by Edward III. Consult Stubbs, ‹Constitutional History of England› (1897).

Magna Græcia, grē'shĭ-a, «Great Greece,» the name commonly given in ancient times to that part of southern Italy which was inhabited by Greek colonists. Apparently the name was in use as early as the time of Pythagoras (586-506 B.C.). Strabo includes the Greek cities of Sicily under the appellation, but the name refers generally only to the Greek cities in the south of Italy, including those on the shores of the Tarentine Gulf and the Bruttian Peninsula, with Velia, Posidonia, and Laüs, on the west coast of Lucania. The name was not at first territorial, or co-extensive with any region, but applied merely to the Greek cities on the coasts. Cumæ was the most ancient of all the Greek settlements in Italy; but from its remote position it was in a great measure isolated from the later Greek settlements. The Achæans were the real colonizers of southern Italy, their first settlement being Sybaris (720 B.C.). A few years later (708 B.C.) Spartan colonists founded Tarentum, and to counteract their encroachments the Achæans founded Metapontum, on the frontier of the territory of the Tarentines, between 700 and 680 B.C. The Locrians founded further south the city known as Locri Epizephyrii, nearly contemporary with Crotona (710 B.C.). The Chalcidic colony of Rhegium on the Sicilian Straits, claims to have been more ancient even than Sybaris. The Greek cities on the shores of Bruttium and Lucania were, Velia excepted (540 B.C.), offshoots from the earlier settlements, and not founded by colonists direct from Greece. The arrival of Pythagoras at Crotona (530 B.C.) produced a marked change in the cities of Magna Græcia, and led to the introduction of great political changes. He and his followers were ultimately expelled from Crotona. Magna Græcia comprised the provinces of Campania, Apulia, Iapygia, Lucania, and Bruttium.

Magnalia Christi Americana, măg-nā'lĭ-ạ krĭs'tī ā-mer-ĭ-kā'nạ, an ‹Ecclesiastical History of New England, from 1620 to 1628,› published by Cotton Mather in 1702. It treats more extensively of the early history of the country than its title seems to indicate, and is divided into seven books: the first treating of the early discoveries of America and the voyage to New England; the second is 'Lives of the Governors'; the third, 'Lives of many Reverend, Learned, and Holy Divines'; the fourth, 'Of Harvard University'; the fifth, 'The Faith and the Order in the Church of New-England'; the sixth, 'Discoveries and Demonstrations of the Divine Providence in Remarkable Mercies and Judgments on Many Particular Persons'; the seventh, 'Disturbances Given to the Churches of New England.' In the sixth book, the author gives accounts of the wonders of the invisible world, of worthy people succored when in dire distress, of the sad ending of many wicked ones, and of the cases of witchcraft at Salem and other places.

Magnentius, măg-nĕn'shĭ-ŭs, **Flavius Popilius,** Roman imperial usurper of the West: d. August 353. Having been entrusted by Constans with a high military command he availed himself of his office to plot the emperor's overthrow. On 18 Jan. 350, presenting himself in imperial purple at a great banquet given by one of the conspirators at Autun, he was saluted with the title of Augustus; and assassins sent for the purpose having despatched Constans, Magnentius was acknowledged as emperor by all the western provinces except Illyria. Constantius, on hearing of his brother's murder, hastened from the confines of Persia and defeated Magnentius (351). These disasters led to the defection of all the countries that had recognized the usurper, who thereupon committed suicide.

Magne'sia, the oxid of magnesium, MgO. See MAGNESIUM.

Magne'sian Limestone, a rock consisting of the mixed carbonates of lime and magnesia. Mineralogically it is known as DOLOMITE (q.v.).

Mag'nesite, a white, porcelain-like mineral (magnesium carbonate, $MgCO_3$,; carbon dioxide 52.4 per cent, magnesium oxide 47.6 per cent), usually found associated with serpenpentine, talcose slates, and dolomite. The magnesite of commerce comes from several localities; notably, Veitsch in Styria, Austria, where it occurs in conformable beds in a Silurian formation; at Frankenstein in Silesia, where a very pure variety is found; at Bolton, Canada, there is a ledge 60 feet wide which is tinged with green by chromium. The quality, however, is not good. In the Red Mountain mining district, Santa Clara and Stanislaus counties, Cal., is found the largest known deposit in the world. Here there are several ledges from 20 to 60 feet wide and of very pure quality. It is also found in Napa, Sonoma, Fresno, Placer, Mariposa, Monterey, and San Luis Obispo counties, Cal. Magnesite is used as a bleaching agent in paper-making, and for making an excellent artificial stone for interior decoration. Its chief use, however, is in the manufacture of firebrick. In brick-making it is calcined, the gas CO_2 being collected and sold for charging mineral water and for use in cold-storage plants, instead of ammonia, and the resulting magnesium oxide mixed with a binding material and pressed into brick. From the pure mineral metallic magnesium and salts, as Epsom salts and magnesium chloride, are manufactured.

O. H. PACKER.

Magne'sium, a metallic element whose compounds are abundant and widely distributed, but which does not occur, in nature, in the metallic form. Magnesium resembles calcium in its chemical deportment, and the oxids of the two metals were long confused with each other. Metallic magnesium was first prepared by Davy, in 1808, both by electrolysis, and by the reduction of white-hot magnesia in an atmosphere of potassium vapor. In 1830 Bussy obtained a larger and purer yield of the metal, by heating a mixture of potassium and anhydrous magnesium chloride to redness. It is best prepared by the electrolysis of the fused anhydrous chloride, or of a mixture of magnesium chloride with the chlorides of sodium, potassium, and ammonium. Pure magnesium is silvery-white in color, lustrous, and moderately hard. It may be hammered, rolled, filed, and polished. Its specific gravity is about 1.70, and its specific heat about 0.245. Its melting point is variously given, the estimates ranging from 850° F. to nearly 1,500° F. When raised to a bright-red heat (out of contact with the air) it volatilizes, depositing upon cool surfaces again in the form of lustrous silvery crystals which belong to the hexagonal system, and are isomorphous with those of zinc. It expands by 0.000015 of its own length, per Fahrenheit degree of rise of temperature; and at 32° F. its electrical resistance is 0.0438 of that of mercury.

Chemically, magnesium is a dyad. It has the symbol Mg, and an atomic weight of 24.36 if $O=16$, or 24.18 if $H=1$. Its most important compounds are the oxid, MgO, the chloride, $MgCl_2$, the sulphate, $MgSO_4$, and the carbonate, $MgCO_3$. Metallic magnesium is not altered upon exposure to dry air, but ordinary air oxidizes it superficially. It dissolves readily in dilute acids, with the formation of the corresponding salts. Chlorine, bromine, iodine, fluorine, sulphur, phosphorus and arsenic combine with it directly. Red-hot metallic magnesium also slowly combines with free nitrogen to form a solid nitride. In the isolation of argon, helium, and the other rare gases of the atmosphere, advantage is taken of this fact for separating these gases from the nitrogen of the air. (See ARGON.) When strongly heated in the air, metallic magnesium takes fire and burns with an exceedingly brilliant white light that is rich in chemical rays; the product of the combustion being magnesia, MgO. Advantage is taken of this property in photography, most of the «flash-light» powders that are used consisting essentially of pulverized magnesium, either alone, or mixed with a small quantity of some explosive or oxidizing agent. Magnesium wil also burn when sufficiently heated in steam carbon dioxid, or sulphur dioxid.

Magnesium oxid, or «magnesia,» MgO, usually prepared by heating the nitrate or ca bonate of the metal; and on account of th method of preparation it is commonly known «calcined magnesia.» Magnesia is a white su stance, without taste or odor. It does not ha a strongly alkaline reaction, but it acts as powerful base, reacting with acids to form magnesium salts. It is scarcely soluble water, but it slowly absorbs moisture and car dioxid from the air, becoming converted into a mixture of the hydrate and carbonate. When made into a paste with water, magnesia sets to a hard, white mass, consisting partly or wholly of the hydrate, $Mg(OH)_2$; but this action does not occur if the magnesia has been previously heated to whiteness. One of the most distinctive characteristics of magnesia is its infusibility. Even when heated in the flame of the oxyhydrogen blowpipe it does not melt, but gives out a bright white light, somewhat similar to that emitted by lime. (See CALCIUM LIGHT.) In the fiercer heat of the electric furnace, magnesia has been melted. On account of its infusibility, magnesia is used in the manufacture of crucibles and of firebrick. It occurs native as the mineral periclase, which crystallizes in the isometric system.

Magnesium chloride, $MgCl_2$, is prepared by dissolving magnesia in hydrochloric acid, and evaporating the solution after the addition of a certain quantity of sal ammoniac. Upon subsequent fusion the sal ammoniac volatilizes, and the magnesium chloride is left behind. This substance is largely used as a preventive of mildew, in the sizing of cotton cloth. The mineral carnallite contains magnesium chloride, having the composition $MgCl_2 + KCl + 6H_2O$. Magnesium sulphate occurs native (in combination with one molecule of water) as kieserite, and it may also be prepared artificially by dissolving magnesium oxid or carbonate in dilute sulphuric acid. When combined with seven molecules of water, magnesium sulphate constitutes the familiar substance known as Epsom salts (q.v.), which is largely used in medicine. Magnesium carbonate, $MgCO_3$, is a white substance, insoluble in water, but soluble in a solution of ammonium chloride, and also in water that contains carbon dioxid in solution. It occurs in nature as the mineral magnesite, which crystallizes in rhombohedral forms, isomorphous with calcite. Dolomite, which occurs in nature in enormous quantities, is a carbonate of magnesium and calcium.

Magnesium salts are used to a considerable extent in medicine. The name «magnesium» is derived from «magnesia,» which substance is said to have been obtained from the province of Magnesia in Thessaly.

Magnet'ic Dip. See DIPPING NEEDLE.

Magnetic Moment. See MAGNETISM.

Magnetic Pole. See MAGNETISM.

Magnetism, the name applied to a peculiar force action first observed in connection with certain iron ores. This ore, often called lodestone, is supposed to have been discovered in Magnesia, a part of Asia Minor. It is not possible to state just when this discovery was made, but certain passages in Lucretius show that something was known concerning it before the beginning of the Christian era. About the year 1200 we have the statement by Neckham that a lodestone free to turn takes up a definite position in space. Some further details were noted by Peregrinus (1269) and Ferrara (1629), but the greatest of the early works is that of Dr. Gilbert, a physician, who published his ‹De Magnete› in 1600. Those interested in the history of the subject may consult the ‹Intellectual Rise of Electricity› by Park Benjamin, in which an excellent historical sketch may be found.

The only direct evidence that a body is magnetic is its ability to exert a force on certain substances, which, by reason of their susceptibility to this action are called magnetic substances. A lodestone brought in contact with several small bodies will select those of iron or steel, if such be present, but show no appreciable force on copper, lead, wood, or in fact on any except iron, nickel, cobalt, and a few others to a lesser degree. Of even greater interest and importance is the fact that the lodestone is able to endow steel or iron with the ability to exert this force. Soft iron loses its external magnetic qualities when removed from the immediate neighborhood of the exciting source, but hard steel or iron will retain this property for a long time. If a bar or rod of hard steel is drawn across a piece of lodestone or other permanent magnet, and is then suspended so as to be free to turn about a vertical axis it will take up a definite position, usually its line of greatest length will be approximately north and south. If it be plunged into a box of iron filings, little magnetic action will be manifest near the middle of the bar, but near the ends considerable quantities of filings will be attracted and may be lifted against the action of gravity. These facts led to the naming of the regions of greatest external action the poles of the magnet and since the lines joining these regions would, in the case of a freely suspended magnet, lie in many places nearly north and south, the pole which seeks the north is often called the north-seeking or positive pole, the other which turns toward the south, is correspondingly named the south-seeking or negative pole. The entire subject was formerly studied with reference to the behavior of like and unlike poles, and it was even supposed that these poles consisted of opposite sorts of magnetic matter. Later investigations have developed methods less directly dependent upon the idea of poles, which are preferable for many purposes.

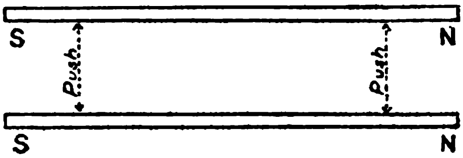

FIG. 1.

If we suppose two long magnets placed as shown in Fig. 1 a study of their mutual force action would indicate that each is exerting a push tending to increase the distance between them, and that the amount of this repulsion will vary with the distance between the magnets. If one of the bars be replaced by another whose magnetic quality is different, the force action will be modified. If one of the magnets be reversed in position a corresponding force tending to reduce the distance between the bars would be observed. It is convenient to use as a preliminary definition the statement that a unit pole is one which would exert unit force upon a precisely equal pole at a distance of one centimetre. The law of pole action can then be stated by saying that the force is equal to the product of the two poles strengths divided by the square of the distance between the poles.

If a freely suspended magnet is brought into the neighborhood of a large bar magnet as indicated in Fig. 2 it will be observed to take up a position somewhat as indicated in the lower part of this diagram, as its point of suspension is moved along the line. The region where this directive force is noticeable is called the *field* of the magnet. (Gilbert's «orb of virtue.») If continuous lines are drawn, which at each point have the direction taken by the free magnet, these lines are called lines of magnetic force, and they offer a very convenient method for a general study of magnetic action. While these lines have no objective existence, it is, nevertheless, desirable to imagine that they are real and that they possess certain definite qualities. They should always be considered as being directed away from the north-seeking or positive pole. In the early conception of magnetic action these lines would have been regarded as the lines of flow of the magnetic material, and the word flux, still in use, bears evidence of this conception. It is convenient also to regard the lines of force as being under tension and capable of repelling each other. The number of actual lines of force which could be drawn about a magnet is infinite. For purposes of comparison, however, it is customary to represent the force action at a point upon the unit pole placed at that point by the number of lines drawn per square centimetre on a surface perpendicular to the field. A unit field is one in which a force action upon a unit pole is one dyne, about the weight of 1-1000 of a gramme.

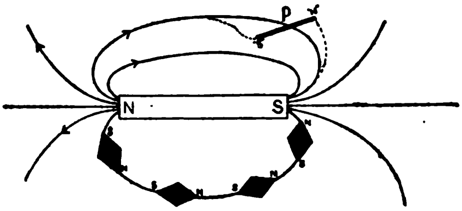

FIG. 2.

In order to compare magnets and to facilitate magnetic computations, certain methods of measurement have been devised. Only a brief sketch can be given here, as full details of these operations may be found in books devoted to this subject, some of which will be mentioned at the end of this article. When a bar magnet is placed at right angles to the lines of a uniform magnetic field it will experience a twist tending to place it along these lines. The amount of this twist will depend upon three things. First: The pole strength of the magnet in question. Second: The distance between the poles. Third: The strength of the field where it is placed. The product of the pole strength by distance between poles is called the magnetic moment of the magnet. When a magnet is suspended freely and slightly displaced from a position parallel to the lines of force it will vibrate about this position. The time required for a complete swing is found to depend upon the magnetic moment, the moment of inertia, and the strength of the field where the magnet is placed. The vibration period may be directly observed and the moment of inertia computed from the dimensions and weight of the magnet. In this way the product of the magnetic moment by the field strength may be found. If the same magnet is held with the line joining its poles east and west it will cause a small freely suspended magnet some distance to the east or west to turn slightly from its equilibrium position. The amount of this deflection depends on the distance between the magnets and the ratio of *magnetic moment* to *field strength.* If we denote the magnetic moment by *ml* and the field strength by *H*, the product of *ml* times *H* is found from time of vibration, and by means of the deflection of the small auxiliary magnet *ml-H* may be determined. When *ml* times *H* or *ml* divided by *H* is known either *ml* or *H* is readily computed. When the field at any point is known, a comparison of the time of vibration of a magnet at the known point with its period when vibrating at any other point enables us to compare the two fields without further measurement. The law of change being that if periodic time is doubled the field strength would be four times as great; or the period varies inversely as the square root of the field in which the magnet vibrates.

The facts mentioned above regarding the ability of a magnet to cause pieces of neutral iron or steel to show magnetic properties is frequently spoken of as magnetic induction. The general phenomena can be readily remembered if we imagine that it is easier for lines of magnetic force to pass through iron than through air. Small pieces, as shown at P, Fig. 2, would have lines entering at «S» and leaving at «N» and would behave as small magnets placed in corresponding positions. Owing to the tension of the lines of force these small pieces would tend to set themselves nearly parallel to the undisturbed direction of the lines. If a sheet of glass or other non-magnetic material is placed over a magnet and iron filings are sprinkled on its surface, a slight tapping, sufficient to overcome friction, will enable the lines of force to arrange the small temporary magnets parallel to the field. In this way maps of magnetic fields may be readily found, and their study throws considerable light upon many details of these peculiar phenomena. Such fields are shown in Figs. 3 and 4. If a sphere of iron or cobalt is free to move in a magnetic field which is not uniform, a tendency is always ob-

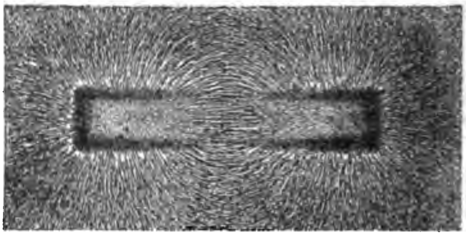

FIG. 3.

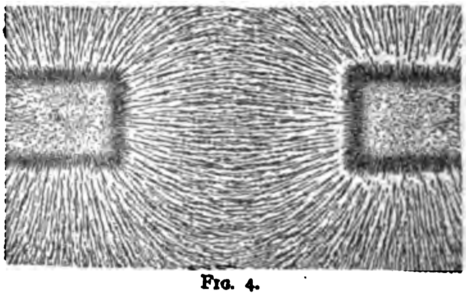

FIG. 4.

served for the iron to place itself in the strongest part of the field, or so that as many of the magnetic lines pass through it as possible. Such a substance is called paramagnetic. Some substances, as for example a sphere of bismuth, will tend to move to the weaker portions of the field, indicating that it is more difficult for magnetic lines to pass through the material than through air. These are called diamagnetic bodies.

The importance of magnetic action in both theoretical and practical affairs is due largely to its intimate connection with the phenomena of the electric current. In fact it is absolutely impossible under any conditions to have an electric current flow in a conductor without producing a magnetic field. In the case of a long straight wire carrying current the magnetic lines are circular in form, concentric with the wire, and their planes are perpendicular to its axis. If a wire is wound in a long, straight, cylindrical coil, frequently called a solenoid, and a current be passed through it, the field produced will be nearly identical with that of a bar magnet, the difference being that the lines of force are entirely in air and are not modified by the peculiar properties of iron. By increasing the strength of the current and the number of turns of wire, a comparatively strong magnetic field may be produced at the centre. A piece of soft iron or steel inserted in the coil becomes a powerful temporary magnet, while strips or bars of hardened iron or steel would in the same way become permanent magnets. The requirements of modern electrical processes have led to very careful investigations of the magnetic behavior of iron in connection with the production and the measurement of electric energy. Only a brief sketch of the fundamental features can be given here. If we suppose an electric current flowing in a long solenoid, which does not contain an iron core, the strength of the magnetic field through the inside of the solenoid may be readily computed from a knowledge of the number of turns of wire and the strength of the current. The symbol *H* is generally used to indicate the field strength when iron is absent. If now a bar of iron be inserted it will be found that the magnetic field is greatly increased. The new field will depend partly on the original value of *H* and partly on the quality and previous magnetic history of the iron inserted. The symbol *B* is generally used to denote the intensity of the field when iron is present. It may then be stated that *B* equals μH, where μ is a variable factor depending on the nature of the iron and the field strength; this factor is called the *permeability*.. The original field *H* is frequently spoken of as the magnetizing field and the new one as the induction. Or *H* stands for the number of lines per square centimetre where iron is absent and *B* stands for the number of lines per square centimetre in the iron. If iron, in a neutral magnetic condition, is placed in a solenoid and the electric current is gradually increased from zero the iron will be subjected to a steadily increasing magnetizing field. A comparison of corresponding values of *B* and *H* in such a case leads to very important results. The relation between these values is best explained by reference to a curve drawn by using these quantities as co-ordinates. Such curves, usually called the curves of magnetization, are shown in Fig. 5. It should be observed that when *H* is almost zero, the induction is very small, then *B* increases more and more rapidly with a rising field until at point 2 the rate of increase of *B* with *H* begins to fall off rapidly, and shortly a value of *B* is reached which cannot be materially increased no matter how strong a magnetizing field is used. For example in the specimens shown it is useless to extend the value of *H* much above 70, and in actual practice this limit would be taken much lower. When as many lines as possible are carried through the iron it is said to be saturated. The exact shape of the magnetization curve will depend upon the nature and previous magnetic history of the specimen, but the ratio *B-H* at any point gives the ability of the iron to multiply magnetic field strength for that particular field. If, however, any definite state of magnetization is attained as at the point M, Fig. 6, it will be found that upon reducing the field, *H*, the values of the induction, *B*, will not agree with those found for the same value of *H* when the field was increasing. In fact if *H* be changed to zero and then to negative values and back again to the former condition the value of *B* will form a loop as indicated. This peculiar lag of the induction when the field is reduced, is called hysteresis, and the hysteresis loop as shown is of practical importance because its area enables one to find the work converted into heat when the magnetization is carried through one complete cycle. The line ON measured the residual magnetism, which is semi-permanent, and will be greater in hard than in soft iron or steel. No matter where the process of magnetization is stopped a series of cyclic changes of the magnetic field always gives corresponding loops.

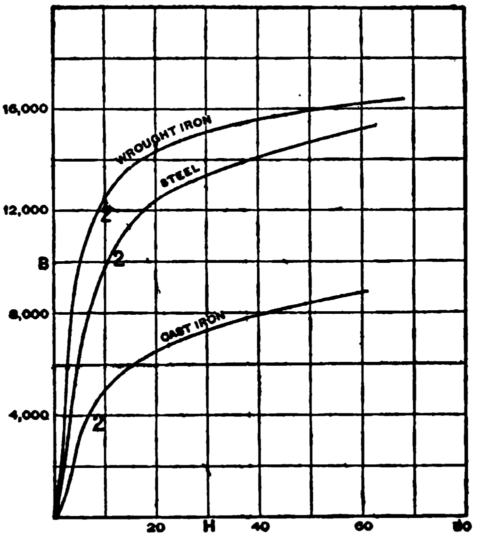

Fig. 5.

A theory which is useful in the correlation of the various phenomena observed in the magnetic behavior of iron is at once suggested by a simple experiment. Take a magnetic steel needle and which shows distinct polarity. Upon being broken into two parts it will be found that instead of securing two isolated poles, that each piece possesses a plus and a minus pole practically identical with the poles of the original needle. Carry this process to any length and each little piece, however small, will be found to possess two poles, one positive and the other negative. If we assume that this process could be carried on to the smallest conceivable particle of the iron we should say that each molecule of the iron is by itself a magnet. We may further suppose that the molecular magnets in a neutral piece of iron are entirely devoid of regular arrangement as regards position of the poles; such a chaotic condition may be indicated roughly by Fig. 7. It may be supposed that these molecular magnets are partly held in position by the action of forces analogous to friction, which also tend to hold them in any new position to a greater or less extent in case the original arrangement is disturbed. Under the action of a weak magnetic field these friction forces would prevent the turning of the molecular magnets into parallelism with the field lines. As soon as the field is strong enough to overcome this sort of friction we might expect the same tendency to arrangement of these minute magnets that is observed in the case of iron filings in the mapping of magnetic fields. As long as a considerable number of the axes of these molecular magnets make fairly large angles with the field lines the leverage by which turning is produced would be considerable; if however they approach parallelism with each other and the field lines, the effective twisting would be very materially reduced. This would correspond to the approximate saturation of the iron and no considerable change in position could be produced by increasing the field strength. The general arrangement may be indicated approximately in Fig. 8, where it will be observed that there is a tendency for free positive poles to appear at one end, namely where the field lines leave the iron and for uncompensated negative poles to appear at the other end.

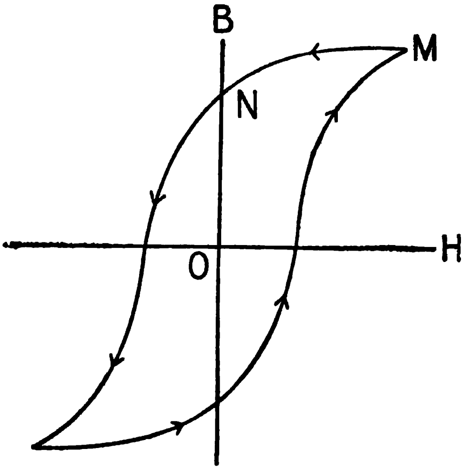

FIG. 6.

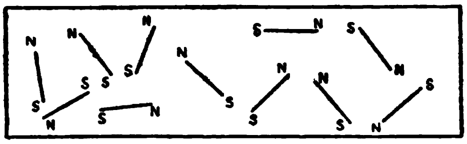

FIG. 7.

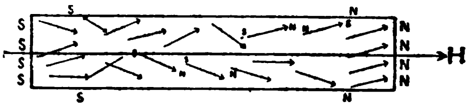

FIG. 8.

The facts in favor of this sort of explanation may perhaps be briefly summarized as follows: (1) The general shape of the magnetic curve is explained. (2) As friction or other molecular forces tend to prevent a return to the original chaotic condition after magnetization this arrangement would in part persist after removal from the field, or permanent magnetism would be explained. (3) Soft iron should be easier to magnetize and less permanent than hardened iron or steel. (4) Jarring as by blows tends to reduce friction and to assist in the process of magnetization and also to reduce permanent magnetism. (5) High molecular activity consequent on rise of temperature decreases magnetic action, in fact, at a dull red heat iron is non-magnetic. (6) Rapid reversals of magnetism involves work against molecular forces and the production of heat, this heat is proportional to the area of the loop. (7) A tube of iron filings or a set of pivoted magnets shows the same behavior in a rising or falling magnetic field as a solid bar. The precise agreement between experimental facts and the indications from theory shown above makes this conception extremely useful. Just why molecules of iron should be permanently endowed with magnetic properties is a subject for speculation which has been indulged in by numerous prominent scientists. It has been supposed for example that electrical currents flow around these molecules, that they consist of vortex rings or that small electrically charged parts are in vibration in such a way as to produce the phenomena of permanent molecular magnetism. The general usefulness of the hypothesis is in no way connected with the truth or falsity of such speculations any more than the facts regarding free fall are dependent on our view of gravitation.

The general statements noted above regarding magnetism of iron are of importance in the manufacture and utilization of magnets for various purposes. Where a considerable amount of permanent magnetism is undesirable, soft iron or steel is always used. For the manufacture of permanent magnets special steel is selected and hardened and is then magnetized by its insertion into a solenoid carrying a powerful electric current. Severe shocks or blows are frequently given in order to assist in the molecular rearrangement. The interaction of all the elementary magnets together with temperature changes and mechanical shocks will tend to weaken a magnet. This loss is very considerable at first but finally an almost permanent state is reached. When used in electrical measuring instruments magnets are artificially aged by subjecting them to considerable changes of temperature and a series of mechanical shocks. It should be noted in this connection that the permanence of the magnet will be somewhat increased by joining its poles, when not in use.

by a piece of soft iron. The induced magnetism at the ends of the iron helps to hold the poles of the small molecular magnets in position, and counteracts the tendency of these poles to demagnetize the bar.

Aside from the extended use of permanent magnets in electrical instruments their practicable application is comparatively limited. The electro-magnet is widely used where it is desired to cause a temporary force action at a distance from the operator, as for example in the telegraph, etc. Powerful electro-magnets are now frequently used to lift large masses of iron during manufacturing processes. It may be noted in this connection that the lifting force of a magnetic piece of iron depends on the square of the number of lines per unit area at the contact face. Only so large an area should be used in contact as can be very highly magnetized by the current available. In the construction of dynamos, motors and transformers, the magnetic quality of the iron used is of great importance. The total number of lines set up (flux) must be sufficient for the operations involved and saturation should not be approached in any part. Where the cross section may be made large, cast iron can be used, but where the flux must be concentrated, special soft iron or steel is required. All air gaps are made as small as mechanical and electrical considerations of construction will permit, in order that the required flux may be more easily set up by the electro-magnets. Or as electrical engineers say, the magnetic “*reluctance*” is made small by use of properly proportioned iron parts and small air gaps in order that the *magneto-motive force* required may not be excessive.

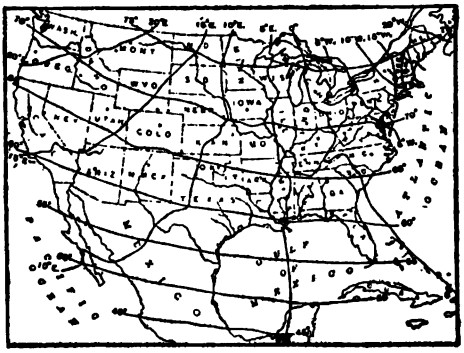

FIG. 9.

Terrestrial Magnetism.—The statement usually made that a freely suspended magnet needle, remote from magnetic masses, tends to point north and south is not correct except for a few localities at certain times. The actual nature of the earth's magnetic field must be found by extended experiments which are being carried on by numerous observers largely under the direction of various governments. (See methods of magnetic measurements above.) If a steel needle be suspended by a silk fibre and carefully balanced so as to hang horizontal and is then magnetized it will be observed to finally come to rest in a certain vertical plane and to be inclined to the horizontal. The angle between a horizontal line and the direction of the needle is called the dip, and the angle between the true north and south plane and that in which the needle lies is called the declination. The values of the dip, declination and intensity of the earth's field at a point are called the magnetic elements at that point. The use of the compass both by the surveyor and mariner over nearly the entire surface of the earth makes an accurate knowledge of these elements indispensable. In order to convey this information, in a practical way, recourse is had to maps on which places having the same declination, for example, are joined by lines. Such maps bring into view many interesting features as regards the earth's magnetism. For example Fig. 9, published by the United States Coast and Geodetic Survey for 1900 shows that in northern Oregon, Idaho and Montana the compass pointed approximately 20 degrees east, while in the extreme northeastern part of Maine it pointed about 20 degrees west. Along an irregular line crossing Michigan, Ohio, North and South Carolina and passing east of Cuba the declination was 0, or the needle pointed due north. It is evident from an inspection of these maps that the poles of the earth considered as a magnet do not coincide with the geographic poles. The line of no dip follows the equator only approximately. North of this line the north end dips down, while at the south it is reversed. Some of the minor variations are no doubt caused by local causes, such as masses of magnetic material, but it is a general belief among observers that the earth's magnetism is largely due to outside agencies. Another very important point for the mariner, who depends on the compass to find his way in safety across trackless seas or the surveyor anxious to locate landmarks, is that these magnetic elements are continually changing even during the day, as well as month by month and year by year. In London during 232 years the declination changed 35 degrees. “A street one mile long laid out in London parallel to the compass direction in 1580 would have its terminus seven tenths of a mile too far east according to the compass in 1812.” Since 1812 the declination at London has changed from about 24 degrees west to 16 degrees west. In 1580 it was 11 degrees east. In fact it would seem that the magnetic poles of the earth are slowly vibrating. The variation during the day must be taken into account in accurate work as a mile run in the morning and repeated in the afternoon, may vary by 5 to 20 feet at its terminus. Sudden changes called magnetic storms also frequently occur, which seem to be associated with atmospheric electrical conditions, sun spots, etc. In order to secure data for the study of these complex phenomena, magnetic observatories are maintained where delicate instruments record, day and night, the countless fluctuations of the magnetic forces.

The problem of the navigator is still further complicated by the use of iron ships which are always sources of disturbance, both because of their permanent as well as their variable magnetism. The continual jarring and changes of temperature during a voyage enables the earth's field to continually change the distribution of magnetism in the vessel. The means to be used for the correction of this deviation have received the attention of many skilful investigators. The limits of this article will hardly allow a discussion of the matter which may be found in special books noted at the end.

The contrast between the state of knowledge regarding magnetism before 1600 and its present development is one of the most striking indications of the growth of scientific investigation. Instead of vague speculations, partial truths veiled in mysticism, more or less direct references to dogma and the supernatural, we have organized knowledge based on experience and constantly checked by experiment and application. The number of those who believe in "magnetic" healing or, that, because an iron pipe driven in the earth shows polarity, the water flowing through it is magnetic and has special medicinal virtues, is constantly on the decrease. The relations between magnetism and other fields of physical research can not be treated in this article, yet it may be well to mention that such relations are constantly being investigated and no one in touch with present developments believes that the end is at hand. And it may well be that the delicately poised magnetic needle in some future interpretation of its countless movements will give us a knowledge of the invisible yet all-pervading agency which governs its fluctuations and lead us to a broader generalization of physical phenomena than we can formulate at present.

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Magnetism, Animal. See ANIMAL MAGNETISM.

Magnetite, or **Magnetic Iron Ore,** native magnetic oxid of iron, Fe_3O_4. It sometimes has part of its iron replaced by titanium or magnesium, and occasionally by nickel. It is very abundant (the production of the United States in 1901 being 1,813,076 tons), and when pure it constitutes a valuable ore of iron, 72 per cent of its weight consisting of that metal. Magnetite crystallizes in the isometric system, commonly in octahedra, but also in dodecahedra, with striated faces. It also occurs, and very generally, in massive and granular forms. It is black in color, with a metallic or submetallic lustre. It is brittle, and has a hardness of from 5.5 to 6.5; the crystals having a specific gravity of about 5.17. It may be readily distinguished by the fact that it is strongly magnetic. Specimens are found which manifest quite a strong, permanent magnetic polarity, this variety of the mineral being known as "lodestone." Magnetite occurs in vast beds in Canada, and in the northern and eastern parts of the United States. Abundant deposits of it are also known in California and Washington.

Mag″neto-elec′tric Machines. See ELECTRO-MAGNETIC MACHINE; ELECTROTHERAPEUTICS.

Mag″neto-elec′tricity. See ELECTRO-MAGNETISM; ELECTRO-MAGNETS.

Magnetom′eter, an instrument employed in observatories to measure the intensity of terrestrial magnetism. A magnet may be allowed to move freely in a horizontal plane by being supported on a fine vertical pivot, or by suspension on a fine untwisted silk thread. Bifilar suspension is more to be depended upon; the magnet is supported by two parallel threads; screws enable the tensions in the threads to be equalized and their distance asunder to be adjusted. See MAGNETISM (*Terrestrial*).

Magnif′icat. The words which Mary pronounced when she visited Elizabeth (Luke i. 46–55) begin, *Magnificat anima mea dominum* ("My soul doth magnify the Lord"). Hence the whole of her thanksgiving on this occasion has been called the Magnificat. The present usage of the Roman Catholic Church is to chant or pronounce the Magnificat every day at vespers.

Magno′lia, Ark., town, county-seat of Columbia County; on the Louisiana & N. and the St. Louis S. R.R.'s; about 138 miles southwest of Little Rock. It is in an agricultural and lumbering region. Considerable cotton and fruit are raised in the vicinity. It has a large trade in lumber, fruit, and cotton. Its chief buildings are the county buildings, the schools, and churches. Pop. (1910) 2,045.

Magnolia, a genus of ornamental, deciduous or evergreen trees and shrubs of the order *Magnoliaceæ*. The 20 species are natives mostly of the United States, India, China, and Japan. They are characterized by large, alternate entire leaves, large white, purple or pink, sometimes yellowish, solitary, terminal flowers, which are often highly fragrant; and cone-shaped, often red, decorative fruits. They are widely planted for ornament in parks and gardens; most of the deciduous species being tolerably hardy as far north as Massachusetts, some even farther north, but the evergreen kinds tender even at Washington, where, however, one species (*M. grandiflora*), can withstand the winters if in protected situations. The wood is close-grained, generally soft, spongy, light and satiny. It is little used because it is not durable, but in Japan one species (*M. hypoleuca*), is used for lacquering. The bark and the fruits of a few species were formerly employed as stimulants and tonics, but have fallen into disuse.

As a rule, magnolias thrive best in rather rich, fairly open, moist, peaty or sandy loams, but generally prove satisfactory upon any garden soil. A few, especially the beaver tree (*M. glauca*), which is also popularly known as sweet, swamp, or white bay, are natives of very wet grounds and must be naturally well supplied with water, when planted for ornament. They may be propagated by means of layers, by grafts, or by seeds planted as soon as ripe or stratified in sand and kept out of doors where they can not become dry. The plants should be transplanted when the new growth is commencing, otherwise the operation is frequently unsuccessful.

The following species are among the most generally planted in the United States. The bull bay or big laurel (*M. grandiflora*) is found naturally from North Carolina to the Gulf States. It is a pyramidal, evergreen tree which often attains heights of 75 feet or more, and is especially conspicuous when in blossom, its fragrant white flowers often attaining a diameter of a foot. The swamp sassafras or sweet bay (*M. glauca*) ranges from the coast region of Massachusetts to Florida and irregularly southwestward to Texas. It reaches a height of 20 feet and bears fragrant cream-colored flowers. The cucumber trees (q.v.) are natives of the southeastern United States and are particularly attractive because of their pink fruits. The flowers of the first are often eight inches in diameter, and conspicuously colored; those of the latter are much smaller and greenish yellow, or green. Of the exotic species the yulan (*M. yulan*), a native of China, where it has been cultivated for more than a thousand years, and *M. pumila*, *M. obovata*, and *M. hypoleuca* are popular, the first and last particularly. By crossing, hybridizing and selection a large number of choice horticultural varieties have been produced.

Magoffin, mȧ-gŏf'ĭn, **Beriah,** American statesman: b. Harrodsburg, Ky., 18 April 1815; d. there 28 Feb. 1885. He was graduated from Centre College (Danville, Ky.,) in 1835, from the law school of Transylvania University (Lexington, Ky.) in 1838, entered the practice of law at Jackson, Miss., in 1839, but in the same year returned to Harrodsburg. In 1840 he became police judge, in 1848, 1856, and 1860 was a delegate to the Democratic national conventions, in 1850 was elected to the State senate of Kentucky, and in 1859–62 was governor of Kentucky. He refused, 15 April 1861, to comply with Lincoln's call for 75,000 troops; in May 1861 by proclamation warned both the Confederate and Federal governments against occupying Kentucky soil, and the citizens of the State against entering hostilities; and in August requested Lincoln to withdraw United States troops. He vetoed a resolution of the legislature directing him to proclaim the evacuation of Kentucky by the Confederates; but the resolution was passed over his veto. In August 1862 he resigned his office, and in 1867 was elected to the lower house of the State legislature.

Magog, mā'gŏg, Canada, town in Stanstead County in the province of Quebec; on Lake Memphremagog at its outlet, and on the Canadian Pacific; about 19 miles southwest of Sherbrooke. It has regular daily communications with Newport and other places in Vermont. Magog is a favorite resort for anglers. Pop. about 5,000.

Magog. See Gog and Magog.

Mag'ot. See Barbary Ape; Macaque.

Mag'pie (originally *pie*, the pied or variegated bird), a bird of the genus *Pica*, closely related to the jays. The genus is distinguished by the extremely long wedge-shaped tail, the middle feathers of which equal the entire length of the head and body, while the outer feathers are less than half as long. The notorious magpie of Europe (*P. rustica*) is represented in North America by the variety *hudsonica*, which is rather larger but otherwise similar. The color is a lustrous black with a varied and changing iridescence and sharply contrasting white under parts and patches on the shoulders and wings, the latter being conspicuous as the bird flies. The yellow-billed magpie (*P. nuttalli*) of California, is precisely similar except that the bill and a naked area at its base are yellow instead of black. Other species inhabit Asia and Africa. In America the common magpie is confined to the west, its range reaching from Alaska to Arizona and from the plains to the Cascade Mountains, being especially common in the Rocky Mountains. The magpie is a handsome bird of saucy, vivacious habits and is chiefly noted for its thieving habits and general rascality. It is always engaged in mischief, either in stealing brightly colored or glittering objects from the habitations of man or in robbing the nests of other birds, but because of its pert, merry manner is usually forgiven for the former class of offenses. The caged birds seen in the east give but a faint idea of the beauty and activity of these birds in the wild state. Like the jays the magpies are omnivorous, but are less strictly arboreal than they. The nest, which is built in a tree or bush, is very ingeniously and substantially constructed. It is a large domed structure protected outwardly by a thick, bristling layer of thorns and twigs, through which a narrow passage opening on one side leads to a deep cup plastered with mud and lined with fibres. Six to nine greenish drab eggs, much spotted and dashed with various shades of brown, are laid. The American magpie is occasionally taken young and made a pet, but it has not the reputation for talking and amusing, albeit thievish, manners which has made the European bird a favorite from ancient times. Descriptions of its many interesting habits will be found in the books of Coues, Ridgway, Merriam, Cooper, Keyser, and other writers upon the ornithology of the western United States.

Magrath', **William,** American painter: b. Cork, Ireland, 20 March 1838. He emigrated to the United States in 1855, and was elected National Academician in 1876. He has produced many excellent landscapes and his genre pictures are full of character. Among them may be mentioned 'The Road to Kenmair' (1871); 'The Reveillé' (1873); 'Rustic Courtship' (1877); 'On the Old Sod' (1879), which last is in the New York Metropolitan Museum.

Magruder, mȧ-groo'dėr, **John Bankhead,** American soldier: b. Winchester, Va., 15 Aug. 1810; d. Houston, Texas, 19 Feb. 1871. He was graduated at West Point in 1830, served for a short time in the 7th infantry, then in the artillery. In 1836 he was made first lieutenant, saw service in the Seminole war 1837–8, and became captain in 1846. He took an active part in the Mexican War, rising to the rank of lieutenant-colonel. In 1861, while in garrison at Washington, D. C., he resigned from the United States army, accepted a Confederate colonelcy, and commanded the artillery at Richmond. In the same year he won the battle of Big Bethel (q.v.), and was made brigadier-general and major-general. Assigned to the Yorktown district, he fortified the Peninsula, and with a force of 12,000 held it against the Army of the Potomac in April 1862. In the Seven Days' Battles (q.v.) he commanded the Confederate left. In October 1862 he was appointed commander of the Department of Texas. He recaptured Galveston 1 Jan. 1863, and broke the blockade of that port. After the War he served as major-general in the army of Maximilian in Mexico until the end of the empire, then settled at Houston for the rest of his life.

Magruder, Julia, American novelist: b. Charlottesville, Va., 14 Sept. 1854; d. Richmond, Va., 9 June 1907. Her literary career began in 1885 with ‘Across the Chasm,’ published anonymously. She wrote: ‘A Magnificent Plebeian’; ‘The Violet’; ‘Miss Ayr of Virginia’; ‘A Manifest Destiny’; ‘Princess Sonia’ (1895); etc.

Maguey, mạ-gwā′. See Fibre.

Maguindanao, mä-gēn-dä′now, a tribe of Moros who inhabit the valley of the Rio Palangui, island of Mindanao; the Moros of the Sarangani Islands, and some of those of Davao Bay belong also to this group. See Philippine Islands.

Magyars, mŏ′gyŏrz, the original name of the Hungarians, which they still use in preference to any other. See Hungary.

Mahâ-bhârata, mä-hä-bhä′rạ-tạ, **The,** the greatest epic of the literature of ancient India. The name signifies ‘The Great (Poem) of the Bhâratas.’ The work is perhaps less truly an epic poem in a strict sense than a collection of epic material; there being a central narrative, but the constituent parts being assembled about it in rather a heterogeneous fashion; and many portions admitting of detachment without the slightest effect upon the poem. The composite authorship of the ‘Mahâ-bhârata’ is indicated by the native ascription of it to Vyâsa, a generic title meaning an “arranger” or “distributer.” In its present state the epos consists of upward of 100,000 couplets of 32 syllables each; and is therefore about eight times more extensive than the combined ‘Iliad’ and ‘Odyssey.’ It is subdivided into 18 parvans, or books, with an appendix or supplementary portion called the ‘Haravança.’ Evidence exists to its currency under its present title as early as 350 B.C., but whether it was then in its present condition has not certainly been determined. Its origin is extremely remote. The main story of the poem concerns the feud between the Kauravas and Pándavas, rival branches of the royal line of Hastinâpura (Delhi), among whose ancestors was the King Bhârata from whom India is sometimes called “The country of the Bhâratas” (Bhârata-varsha). The Pándavas are represented as goodness and heroism personified; the Kauravas generally as inconceivable villains. A final war results in the complete victory of the Pándavas. The episodical material which thickly overlays the central theme assumed an encyclopædic character; and the study of the ‘Mâha-bhârata’ became as much an education for the Hindu as that of the ‘Iliad’ and ‘Odyssey’ once was for the Greek. Much of the ‘Mâha-bhârata’ must to the general reader appear grotesque or even absurd. But, even so, it will continue remarkable for its vast scope, its lofty teachings, and the literary merit of many parts. The so-called *editio princeps* of the text is that of 1834–9 (Calcutta). There is also an edition of 1890. A rendering into English was begun by Protap Chunder Roy in 1883 and has been contributed to by other Hindus. Translations from it have also been made by H. H. Milman (‘Nala’ 1860) and Sir Edwin Arnold (‘Indian Idylls’ 1883). Consult: Monier-Williams, ‘Indian Epic Poetry’ (1863); Wheeler, ‘The Vedic Period of the Mahâ-bhârata’ (1867); Goldstücker, ‘Literary Remains,’ Vol. II. (1879); Wheeler, ‘Short History of India’ (1884). See Sanskrit Literature.

Mahadeva, mạ-hā-dā′vạ, in Hindu mythology, a deity who shares the attributes of Siva in the Indian Trinity, Mahadeva being regarded as a generator as well as a destroyer.

Mahaffy, mạ-hăf′ĭ, **John Pentland,** Irish Greek scholar: b. Chapponaire, near Vevay, Lake Geneva, Switzerland, 12 July 1839. He was educated in Germany and at Trinity College, Dublin, from which he was graduated in 1859; was appointed to a competitive fellowship in 1864; and became professor of ancient history in the college in 1871. In 1873 he was Donnellan lecturer. His first publication was a translation of Kuno Fischer's ‘Commentary on Kant’ (1866); and on philosophical subjects he has since issued ‘Kant's Critical Philosophy for English Readers’ (with J. H. Bernard 1872; new ed. 1889), containing a translation of the ‘Prolegomena’ and a defense of the critical philosophy; and a volume on ‘Descartes’ (1880) in Blackwood's ‘Philosophical Classics.’ The greater number of his works, however, treat of the history, literature, and everyday life of ancient Greece, among these being the following: ‘Prolegomena to Ancient History’ (1871); ‘Greek Social Life from Homer to Menander’ (1874); ‘Greek Antiquities’ (1876), a work much used in Continental schools; ‘Rambles and Studies in Greece,’ a record of antiquarian research (1876); ‘Old Greek Education’ (1879); ‘History of Classical Greek Literature’ (1880; 3d ed. 1891); ‘Greek Life and Thought from Alexander to the Roman Conquest’ (1887), a continuation of the work of 1874; ‘The Greek World under Roman Sway’ (1890), a continuation of the preceding; ‘The Story of Alexander's Empire’ (1890); ‘Greek Pictures’ (1890); and ‘Problems in Greek History’ (1892); ‘The Progress of Hellenism in Alexander's Empire’ (1905). He edited the English translation of Victor Duruy's ‘Roman History’ (1883–6); and has given some attention to Egyptian history, especially in the Greek period, the fruits of his studies in this field being his edition of the ‘Flinders-Petrie Papyri’ for the Royal Irish Academy (1891–3), and a work on the Empire of the Ptolemies (1896). He writes with particular interest and authority of the post-Alexandrian period of Greek life; and is continually discovering interesting parallels between that and modern civilization. What he may have sacrificed in pure scholarship he has gained in the vividness of his historical presentation. Among his other writings are: ‘Twelve Lectures on Primitive Civilization’ (1868); ‘Report on the Irish Grammar Schools’ (1880–1); ‘The Decay of Modern Preaching’ (1882); and ‘The Art of Conversation’ (1889).

Ma′haleb, a species of European cherry-tree (*Cerasus Mahaleb*), whose fruit affords a violet dye and a fermented liquor. Its flowers and leaves are used by perfumers, and its wood by cabinet-makers. See Cherry.

Mahan, mạ-hăn′, **Alfred Thayer,** American naval officer: b. West Point, N. Y., 27 Sept. 1840. He was graduated from the United States Naval Academy in 1859, and served during the Civil War, rising to the rank of lieutenant-commander in 1865. In 1885 he was promoted captain, and in 1886 was appointed president of the Naval War College at Newport, a position which he held till 1888, and again from 1892–3. In 1893–5 he was commander of the Chicago, and in 1896 was retired from active service at his own request. In 1898 during the war with Spain he was a member of the Naval Board of Strategy; and in 1899 one of the United States delegates to The Hague Peace Conference. In 1890 he published his chief work, 'Influence of Sea Power upon History'; the continuation, 'Influence of Sea Power upon the French Revolution and Empire' appeared in 1892; his other writings include: 'The Gulf and Inland Waters' (1883); 'Life of Admiral Farragut' (1892); 'Life of Nelson' (1897), highly commended by English critics; 'The Interest of the United States in Sea Power' (1897), a compilation of his magazine articles; 'Lessons of the Spanish War' (1899); 'The Problem of Asia' (1900); 'The South African War' (1900); 'Types of Naval Officers' (1901); 'Retrospect and Prospect' (1902). His 'War of 1812' appeared in 'Scribner's' in 1904.

As a historian he has made a distinct contribution to historical science as the first writer to demonstrate the determining force which maritime strength has exercised upon the fortunes of individual nations, and consequently upon the course of general history. Technically, his representative work, the 'Influence of Sea Power upon History,' is but a naval history of Europe from the restoration of the Stuarts to the end of the American Revolution. But the freedom with which it digresses on general questions of naval policy and strategy, the attention it pays to the relation of cause and effect between maritime events and international politics, and the author's literary method of treatment, place this work outside the class of strictly professional writings and make it a recognized leading authority. His prime object, in establishing the thesis that maritime strength is a determining factor in the prosperity of nations, was to reinforce his argument that the future interests of the United States require a departure from the traditional American policy of neglect of naval-military affairs. Captain Mahan was president of the American Historical Association in 1902–3; and has received honorary degrees from several universities, including Oxford and Cambridge, England.

Mahan, Asa, American Congregational clergyman and educator: b. Vernon, N. Y., 9 Nov. 1800; d. Eastbourne, Sussex, England, 4 April 1889. He was educated at Hamilton College, Clinton, N. Y., and Andover Theological Seminary, and after holding pastorates at Pittsford, N. Y., and Cincinnati, Ohio, was president of Oberlin College 1838–50; and also professor of philosophy there. He was president of Cleveland University 1850–6; and of Adrian College, Mich., 1860–71. After the last named date he lived mainly in England. Among his works were: 'Doctrine of Christian Perfection' (1839); 'System of Intellectual Philosophy' (1845); 'The Will' (1846); 'Science of Logic' (1857); 'Mental Philosophy' (1882); 'History of Philosophy' (1883).

Mahan, Dennis Hart, American military engineer: b. New York city 2 April 1802; d. near Stony Point, N. Y., 16 Sept. 1871. He was graduated at West Point in 1824, where in 1825 he was appointed assistant professor of mathematics and of engineering. He was stationed in Europe four years on professional duty and in 1832 returned to West Point as professor of military engineering, where he remained until his suicide, which was caused by temporary insanity. His text-books are generally recognized authorities and include: 'Treatise on Field Fortifications' (1836); 'Descriptive Geometry' (1864); 'Military Engineering' (1865); 'Permanent Fortifications' (1867); 'Military Course of Civil Engineering' (1837, rewritten 1868); etc.

Mahanadi, mā-hā-nŭd'ĭ, or **Mahanuddy,** a river in British India. In the upper part of its course it drains the fertile plain of Chattisgarh in the Central Provinces; flows southeast and then east through the province of Orissa, past Sambalpur and Cuttack, into the Bay of Bengal by two mouths, after a course of about 530 miles. During the rains it is navigable 300 miles from its estuary, but a large portion of its channel is dry during five or six months of the year. An extensive system of irrigation canals is connected with it. Diamonds are found in this river and in several of its tributaries.

Mahanoy (mā-hạ-noi') **City,** Pa., borough, in Schuylkill County; on Mahanoy Creek, and on the Lehigh Valley and the Philadelphia & Reading R.R.'s; about 55 miles northeast of Harrisburg. The first settlement was made in 1859, and it was incorporated in 1863. It is in the anthracite region, and in the vicinity is fireclay and an excellent building-stone. Its chief manufactures are pottery, foundry products, flour, hosiery, and lumber. In the vicinity are about 20 collieries, all of which are operated by residents of Mahanoy City. The trade is principally in coal, pottery, and lumber. The city has excellent public and parish schools and a number of fine churches. Pop. (1910) 15,936.

Maharajah, mạ-hā-rā'jạ, a title used in India; applied in courtesy to every rajah, or to any person of high rank or deemed holy.

Mahaseer, mā'hạ-sēr, a large and ravenous barbel (*Barbustor*) of India, which reaches six feet in length and in the early part of the rainy season afford the best sport known to the anglers of India and Ceylon, as they take a fly readily, and struggle with the gameness and energy of a salmon to get free, pleasantly taxing the skill of the angler to bring them to land without breaking rod and line. They spawn at the heads of the hill-rivers, and then descend before the young are hatched. The fry then have an opportunity to grow in comparative safety to a size which enables them, the following season, to descend the rivers and take care of themselves; otherwise they would be devoured in infancy by their elders.

Mahat'ma, a Hindu word meaning «the great-souled one,» and applied among the Brahmans to one who has attained the highest possible point of spiritual enlightenment. It is also the name of a high priest or «wise leader» of the theosophists (q.v.).

Mahâyâna, a term applied to the «Northern School» of Buddhism which some centuries after the death of Buddha (q.v.) had spread and become the dominant system in northern India, including Kashmir and Nepal. Mahâyâna is a Sanskrit term meaning «Large Vehicle,» so called because it is averred to be a system which affords salvation to a larger number of persons than are reached by the «Southern School»— Hinâyâna, the «Little Vehicle.» Mahâyâna corresponds with the Lamaism (q.v.) of Tibet and Mongolia. The Hinduistic and Shamanistic notions of the northern barbarians have been absorbed by it and the gods and rites that belong to Shivaism (q.v.) have become adopted so as to alterate the purity of original Buddhism. A thousand new Buddhas appear in its doctrines, among whom is Adi-Buddha, who at Nepal assumed the prerogatives and demanded the worship belonging only to the Supreme Being. In certain Japanese sects so far has «The Great Vehicle» diverged from true Buddhism that priests are allowed to marry.

Mahdi, mä'dē. See MAD MULLAH.

Mahé, mā-hā', Indian Ocean, the largest island of the Seychelles Archipelago, belonging to Great Britain. It is 17 miles long by 4 miles broad, has an area of 55½ square miles, and attains an elevation of 2,000 feet above sea-level, from which it rises in most places nearly perpendicularly. It contains Victoria, the administrative seat, and a coaling station with a good harbor. See SEYCHELLES.

Mahhol. See MACHOL.

Mahi Kantha (mä'hē kăn'thạ) **Agency,** India, a group of 39 native Gujerat states, administered since 1820 by a British political agent of the province of Bombay. The chief state Idar, occupies about one half of the combined area of 9,300 square miles. Pop. about 375,000, consisting largely of wild Bhil and Khoil tribesmen.

Mahican, mä-hĭk'an (meaning «wolf»), an Algonquin tribe of American Indians formerly occupying the Hudson River Valley. They were closely related to the Delawares and the Mohegans, the collective tribes being known as the *Loup* or Wolf Indians. At one time there was a settlement of 40 villages near the site of the present city of Albany. The assaults of the Iroquois and the white settlers diminished the tribe until the remnants of the race became merged with the Delawares. About 550 of the tribe still remain, located upon a reservation near Green Bay, Wis.

Mahmud (mä-mood') **I., or Mohammed,** Turkish sultan: b. Constantinople 1696; d. 1754. He was the son of Mustapha II. and succeeded his uncle Achmet III. He was a well-disposed but incapable monarch and his reign is of little importance.

Mahmud II., Turkish sultan: b. 20 July 1785; d. 1 July 1839. He was the second son of Abd-ul Hamid II., and under the reign of his uncle Selim III. he received an education exceptionally broad for a prince of his station. He succeeded his brother Mustapha in 1808 and organized his government on a reform basis. He conducted a war against Russia and Servia until 1812, subjected the Wahabees and quelled the insurrection of Ali Pasha in 1822. In his war with the Greeks he incurred the intervention of the powers with disastrous results to his forces. Mahmud was a progressive monarch, he introduced modern ideas of warfare, a regular police system, and founded schools. Against serious obstacles he crushed the janissaries, but a second rebellion of Mehemet Ali in 1839 was followed by a defeat which shortly preceded the broad-minded monarch's death.

Mahmud, sultan of Ghazni, the founder of the Mohammedan empire in India: b. Ghazni about 970; d. 29 April 1030. His father Sabaktagin, governor of Ghazni, owed a nominal allegiance to Persia, but was really independent. On his death Mahmud put aside his brother Ishmael, whom his father had appointed to succeed him, took the title of sultan, then overthrew the Persian monarchy, and laid the foundation of an extensive empire in Central Asia. He then turned his attention to India, which he invaded repeatedly. His earlier expeditions into the country were directed against successive rajahs of Lahore, on whom he inflicted repeated defeats. In 1008 the rajah of Lahore, Anangpal, with the assistance of a powerful coalition of rajahs, had assembled one of the largest armies yet seen in the Panjab, but Mahmud was again victorious, and carried away enormous spoils from the Temple of Nagarcot (1008). On his return he celebrated a triumph at Ghazni. In 1010, after subduing Ghor in the Hindu-Kush, he resumed his conquests in India, captured Multan, plundered the Temple of Tanesar, and continued for a series of years to extend his conquests in successive expeditions. These for a time were interrupted by his conquest of Transoxiana, effected in 1016. In 1017 he set out at the head of an army of 100,000 foot and 20,000 horse, passed the Jamna Jummd, and turning to the south appeared before Canoj, the largest and most magnificent Indian city of the day, the rajah of which took precedence of all the Indian rajahs. As the rajah of Canoj at once submitted it was spared from pillage, a fate to which Mattra, a famous religious city, was subjected without restraint for twenty days. In 1023 he annexed the territories of Jeipal II., who had revolted, and established for the first time a permanent Mohammedan garrison in Lahore. His last, which is usually called his 12th, expedition into India (1024–6) was directed against Gujerat. He took the capital and changed the government, but the chief attraction was Somnáth. The magnificence of its temple filled him with wonder, and the descriptions of it suggest images of the palace of Aladdin. Its lofty roof was supported by 56 pillars carved and glittering with precious stones. It was lighted by a lamp suspended from the center by a gold chain. A huge idol, which Mahmud broke, was found hollow, and disclosed immense treasures in diamonds and precious stones. The pieces of the idol were sent to Mecca, Medina, and Ghazni. The remainder of his enterprises were confined to western Asia. Mahmud was avaricious, and loved to accumulate treasures from his warlike expeditions.

Mahog'any. A popular name for the timber of several unrelated trees, among which are various species of eucalyptus (q.v.), natives of Australia and members of the natural order *Myrtaceæ;* two species of Cercocarpus, of the order *Rosaceæ, C. parvifolius* being known as valley mahogany and *C. leidfolius* as mountain mahogany in the Rocky Mountain region where they are native and are mainly used for fuel. African mahogany (*Khya senegalensis*), East Indian mahogany (*Soymida febrifuga*) and *Cedrela toona,* an East Indian tree equally well known also as the toona, all belong to the natural order *Meliaceæ*, but are less important timber trees than the true mahogany (*Swietenia mahagoni*) of the same natural order. This species is a native of tropical America, occasional small specimens being found in extreme southern Florida. It was formerly abundant in the West Indies, reaching altitudes of 1,500 feet or more in Jamaica, but on account of the demand it is now scarce. Cuba and San Domingo formerly supplied the choicest; Honduras the low grades; now, practically all comes from Central America. The wood is generally some shade of brown, fine grained, easily polished and durable except under lateral strain. It is highly valued for furniture, musical instruments, interior house-finishing, etc., and is one of the most popular woods of the world. Formerly it was used for ship-building but now very little. The tree, which sometimes attains heights exceeding 100 feet, and diameters of six feet, has abruptly pinnate leaves with usually four pairs of leaflets, and small white or yellowish flowers in axillary or nearly terminal panicles. As an ornamental tree it is planted in southern Florida and southern California in rich soil. A few other related species of this genus are occasionally found in commerce.

Mahom'et. See MOHAMMED.

Mahon, mä-hōn', or **Port Mahon** (ancient *Portus Magonis*), Spain, city and port, on the island of Minorca, of which it is the capital, at the head of a bay which forms one of the best harbors on the Mediterranean. Fishing, fish-curing, agriculture, and stock raising are the chief occupations. In the bay are several rocky islets, on one of which stands an arsenal, on a second a lazaretto, and on a third a naval hospital. The harbor is strongly fortified. The exports are brandy, wine, dried fruits, agricultural produce, etc.; and the imports, grain, wearing apparel, tobacco, sugar, coffee, cacao, leather, hats, and other manufactured goods. Its trade amounts to about $1,000,000 annually. Mahon was occupied by the English in 1708. It was taken from them, after a memorable siege, by the French under Marshal Richelieu on 28 June 1756. Admiral Byng was shot for failing to relieve it. It was restored to the English in 1763; and taken by the Spaniards in 1782. It was retaken in 1798, and finally given up to the French by the Treaty of Amiens in 1802. Pop. about 20,000.

Mahone, mạ-hōn', **William,** American soldier and politician: b. in Southampton County, Va., 1 Dec. 1826; d. Washington, D. C., 8 Oct. 1895. He was graduated at the Virginia Military Institute in 1847, and became a civil engineer and railroad constructor. At the opening of the Civil War he entered the Confederate army; took part in the Peninsular and Rappahannock campaigns, and by bravery at Petersburg acquired the sobriquet «The Hero of the Crater.» (See PETERSBURG, OPERATIONS AROUND.) In 1864 he was made brigadier-general and major-general. The war over, he accepted the presidency of the Norfolk & Tennessee Railroad, and also became active in politics. He was the principal organizer (about 1878) and leader of the Readjusters (q.v.), chiefly a faction of the Democratic party in Virginia who favored the forcible readjustment of the State debt on terms involving conditional or partial repudiation. Mainly by the supporters of this movement, he was elected in 1880 to the United States Senate, where, however, he acted with the Republicans, making the vote of the Senate a tie and disappointing the Democrats of their expected majority. By this and other acts of his senatorial career he lost favor with his constituents and was not re-elected.

Mahony, mäh'ō-nĭ, **Francis Sylvester,** «Father Prout,» Irish author: b. Cork 1804; d. Paris 1866. Educated at a Jesuit seminary at Amiens, he studied theology at Paris, was admitted into the Order of the Jesuits and taught for some time in a Jesuit college in Ireland, but for some irregularities was deprived of the position of a member of the order. He received clerical ordination and officiated for a short time at Cork and in London, but soon adopted the profession of literature. In 1834–6 he contributed the ‹Prout Papers› to ‹Fraser's Magazine,› published as the ‹Reliques of Father Prout› in 1836. In 1846 he became Roman correspondent to the *Daily News*, his letters being afterward republished as ‹Facts and Figures from Italy› (1847). In his later years he was Paris correspondent for the *Globe*. The ‹Reliques of Father Prout› in a revised and enlarged form were published in 1860, and ‹Final Reliques› in 1876. In 1881 Charles Kent published a collective edition with a memoir. He will be longest remembered by his poem ‹The Bells of Shandon.›

Mahrattas, mạ-răt'ạz, a native Hindu race, supposed to be descendants of the Persians, and occupying a large tract of central and western India. They came into prominence about the middle of the 17th century, when the chief Sevaji extended his conquests in various directions, had himself crowned king in 1674, and established the Mahratta empire. After his death long minorities and the incompetency of the sovereigns caused the powers of the state to fall into the hands of the *Peishwa* or prime minister, who became the acknowledged head of a Mahratta confederacy. This confederacy held together till 1795, but subsequent wars and disturbances reduced the Peishwa to the position of a British dependent, and Scindia, Holkar, and the rajah of Berar were able to take the position of independent sovereigns. The confederacy came to a final end in 1818, and Scindia, Holkar, the Guicowar of Baroda, and the rajah of Kolapore became dependent princes under British protection. Though devout worshippers of Brahma, no distinction of caste exists among them.

Mai, Angelo, ăn'jā-lō mä'ē or mī, CARDINAL, Italian classical scholar: b. Schilpario, near Bergamo, Italy, 7 March 1782; d. Albano, 8 Sept. 1854. His abilities attracted the notice of Father Mozzi, a Jesuit, who instructed him in Latin, Greek and mathematics. On the establishment of a Jesuit college at Colorno, in the duchy of Parma, he accompanied Father Mozzi thither in 1799, and a few years afterward was made professor of Latin and Greek in the Jesuit college at Naples. He was transferred to Milan (1808), where he became an associate of the Ambrosian College, and one of the Curators of the Ambrosian Library. One special department to which he devoted himself was the examination of the palimpsests (q.v.) and through his industry in deciphering these, two volumes of fragments of Cicero's orations, of Lysimachus and of Isæus, a fragment of the ‘Vidularia’ (a lost comedy of Plautus), and a collection of the letters and other writings of Cornelius Fronto, the preceptor of Marcus Aurelius, were recovered and given to the world. In 1819 he was appointed chief keeper of the Vatican Library at Rome, and discovered beneath a manuscript of St. Augustine's ‘Enarrationes in Psalmos’ obliterated fragments of Cicero's treatise ‘De Republica,’ amounting to about a fourth of the original, which he published in 1822 with a critical commentary. A colossal work was then undertaken by Mai, the editing of the various unpublished manuscripts in the Vatican, sacred and profane. It comprises ten quarto volumes, under the title of ‘Scriptorum Veterum Nova Collectio e Vaticanis Codicibus edita’ (1828–38), and consists of numerous fragments, previously believed to be lost, of the ancient historians, such as Polybius, Diodorus Siculus, Dionysius of Halicarnassus, Dion Cassius, Appian, and others, besides the various writings of the fathers. In 1838 he was created a cardinal. A new collection, ‘Spicilegium Romanum,’ was published in ten volumes between 1839 and 1844, and a patristic series, called ‘Nova Patrum Bibliotheca,’ issued between 1845 and 1853, closed his list of publications.

Maia, mā'yạ, in Greek mythology, the eldest daughter of Atlas and Pleione. She was placed with her six sisters among the stars, where they have the common name of *Pleiades*. The Romans also worshipped a Maia, who was also called *Majesta,* and was afterward identified with the daughter of Atlas. The Tusculans called their principal deity *Majus*. The month of May is said to have received its name from them.

Maid of Athens, immortalized by Lord Byron, was Theresa Macri, who 25 years after Byron's poem was written had lost her beauty, lived in a hovel in dire poverty and had reared a large family.

Maid Marian, a name given Matilda, daughter of Fitz-Walter, baron of Bayard and Dunmow. She eloped with Robert Fitz-Ooth, an outlaw, and lived with him in Sherwood Forest. It is supposed that she was married by Friar Tuck to Fitz-Ooth, who was more commonly called Robin Hood.

Maid of the Mist, (1) the name of a small steamboat formerly used on the Niagara River below the Falls, to carry passengers close to the cataract. (2) A name given to the heroine of Sir Walter Scott's ‘Anne of Geierstein.’

Maid of Orleans, a name given Jeanne d'Arc (1412–31) (q.v.).

Maiden, or **The Widow,** an instrument of capital punishment used in Scotland during the 16th century, the prototype of the French guillotine (q.v.): It consisted of an upright frame and a broad piece of iron a foot or more wide, sharp on the lower part, and loaded above with lead. At the time of execution this was pulled up to the top of the frame, in which was a groove on each side for it to slide in. The prisoner's neck being fastened to a bar underneath, on a sign given the cutting iron was let loose, and the head instantly severed from the body.

Maiden Queen, in England, a popular title bestowed upon Queen Elizabeth.

Maidenhair Fern. See Ferns and Fern Allies.

Maid'stone (Saxon Medwegestun) England, municipal and parliamentary borough and the county town of Kent; 32 miles south-southeast from London; on the banks of the Medway. The town consists chiefly of four principal streets, which cross each other at the marketplace, with smaller ones branching off at right angles. It has a fine old church and one of the largest parish buildings in the kingdom, supposed to be of the 14th century. It has excellent educational institutions; schools, libraries, science and art institutions, museums, play grounds, and parks. The chief industries are paper-making (for which there are several large mills) and brewing. An extensive trade is carried on in fruit and hops. The Medway is navigable for 15 miles above the town. Pop. about 34,000. Consult: Cave-Browne, ‘Maidstone’; Russell, ‘History of Maidstone.’

Maidu People, an aboriginal Pujunan group of Indians of northern California, of which the chief tribe, the Concow, inhabited the region of the Upper Sacramento River. Their descendants are to be found in the Round Valley Reservation. Their communities comprised rough dwelling-places or hogáns built of boards, large circular halls or town-houses for assemblies and ceremonials, and wicker storehouses for the winter supply of acorns which with piñons formed their staple food supplies. Their clothing was of the scantiest description; the chief of their numerous dances was the acorn dance; and they had a secret male society in which the initiatory age was twelve.

Maignan, Albert, ăl-bār mā-nyän, French painter: b. Beaumont, Sarthe, 15 Dec. 1844; d. Paris 29 Sept. 1908. He studied at Paris under Nöel and developed a strong and original manner in historical and landscape painting. At the Salon of 1879 he was awarded a first class medal. Amongst the most striking of his pictures are ‘Dante's Meeting with the Countess Matilda’ (1881) now in the Luxembourg; and ‘Assault on Pope Boniface VIII. at Anagni’ in the New York Metropolitan Museum of Art.

Maigre, mā'gėr, or **Meagre,** a large European drum-fish (*Sciæna aquila*), common in the Mediterranean, where it forms one of the most important local food-fishes. It may attain a length of six feet, and its flesh has always been a favorite with epicures. Yarrell says that anciently on account of its large size it was always sold in pieces, and that the fishermen of Rome were accustomed to present the head, considered the finest part, as a sort of tribute to the three local magistrates who acted for the time as the conservators of the city.

Mail-shell. See Chiton.

Maildun, măl'doon, hero of Irish romance. He was the son of Allil Ocar Aga, of the tribe of Owenaught of Ninus, in County Clare, and before his birth his father was killed by pirates. He grew up handsome and accomplished, but had scarce reached manhood before he set sail with a crew of 60 men to find his father's murderer. For three years and seven months he voyaged on the Western Ocean seeing marvels such as no eyes had seen before. At length he found the murderer of his father, but pardoned him his wrong in gratitude to the great mercy of God who had delivered him from so many perils. See Tennyson, 'The Voyage of Maeldune.'

Maimon, mī'mōn, **Solomon,** German philosopher: b. near Mir in Minsk, 1754; d. Siegersdorf, Lower Silesia, 22 Nov. 1800. He was trained for a rabbi, but having become acquainted with the philosophy of Maimonides, he made his way to Berlin, and studied modern philosophy, languages, and some science. Besides cultivating his own mind, and teaching a little, he wrote some philosophical treatises and literary hack-work. Yet he had Mendelssohn, the philosopher, among his friends, was admired by Kant, and attracted the attention of Goethe. This he owed to his 'Attempt at a Philosophy of Transcendentalism' (1790), in which he set out to supplement Kant's system with truths gleaned for the most part from Spinoza, Leibnitz, Hume, Locke, and others.

Maimonides, mī-mŏn'ĭ-dēz, properly MOSES BEN MAIMON BEN JOSEPH (Arabic, Abu Amram Musa ibn Maimun Obeid Allah al-Korlobi), Jewish scholar: b. Cordova, Spain, 30 March 1135; d. 13 Dec. 1204. At an early period he developed a taste for the exact sciences and for philosophy. He read with zeal not only the works of the Mohammedan scholastics, but also those of the Greek philosophers in such dress as they had been made accessible by their Arabian translators. In this way his mind, which by nature ran in logical and systematic grooves, was strengthened in its bent; and he acquired that distaste for mysticism and vagueness so characteristic of his literary labors. He went so far as to abhor poetry, the best of which he declared to be false, since it was founded upon pure invention — and this too in a land which had produced such noble expressions of the Hebrew and Arab muse. It is strange that this man, whose character was that of a sage, and who was revered for his person as well as for his books, should have led such an unquiet life, and have written his works so full of erudition with the staff of the wanderer in his land. For his peaceful studies were rudely disturbed in his 13th year by the invasion of the Almohades, or Mohammedan Unitarians, from Africa. They not only captured Cordova, but set up a form of religious persecution which happily is not always characteristic of Islamic piety. Maimonides' father wandered to Almeria on the coast; and then (1159) straight into the lion's jaws at Fez in Africa,— a line of conduct hardly intelligible in one who had fled for the better exercise of the dictates of conscience. So pressing did the importunities of the Almohad fanatics become, that together with his family Maimonides was compelled to don the turban, and to live for several years the life of an Arabic Marrano. This blot upon his fair fame — if blot it be — he tried to excuse in two treatises, which may be looked upon as his "Apologia pro vita sua": one on the subject of conversion in general (1160), and another addressed to his co-religionists in southern Arabia on the coming of the Messiah. But the position was untenable and in 1165 we find Maimonides again on the road, reaching Accho, Jerusalem, Hebron, and finally Egypt. Under the milder rule of the Ayyubite caliphs, no suppression of his belief was necessary. Maimonides settled with his brother in old Cairo or Fostat; gaining his daily pittance, first as a jeweler, and then in the practice of medicine; the while he continued in the study of philosophy and the elaboration of the great works upon which his fame reposes. In 1177 he was recognized as the head of the Jewish community of Egypt, and soon afterward was placed upon the list of court physicians to Saladin. When he died, his body was taken to Tiberias for burial.

Perhaps no fairer presentation of the principles and practices of rabbinical Judaism can be cited than that contained in the three chief works of Maimonides. His clear-cut mind gathered the various threads which Jewish theology and life had spun since the closing of the Biblical canon, and wove them into such a fabric that a new period may fitly be said to have been ushered in. The Mishnah had become the law-book of the Diaspora; in it was to be found the system of ordinances and practices which had been developed up to the 2d century A.D. In the scholastic discussions in which the Jewish schoolmen had indulged their wit and their ingenuity, much of its plain meaning had become obscured. At 23 Maimonides commenced to work upon a commentary to this Mishnah, which took him seven years to complete. It was written in Arabic, and very fitly called 'The Illumination'; for here the philosophic training of its author was brought to bear upon the dry legal mass, and to give it life as well as light. The induction of philosophy into law is seen to even more peculiar advantage in his 'Mishnah Tōrah' (Repeated Law). The scholastic discussions upon the Mishnah had in the 6th century been put into writing, and had become that vast medley of thought, that kaleidoscope of schoolroom life, known by the name of Talmud. Based upon the slender framework of the Mishnah, the vast edifice had been built up with so little plan and symmetry that its various ramifications could only be followed with the greatest difficulty and with infinite exertion. In turn, the Talmud had supplanted the Mishnah as the rule of life and the directive of religious observance. Even before the time of Maimonides, scholars had tried their hand at putting order into this great chaos; but none of their efforts had proved satisfactory. For ten years Maimonides worked and produced this digest, in which he arranged in scientific order all the material which a Jewish jurist and theologian might be called upon to use. Though this digest was received with delight by the Jews of Spain, many were found who looked upon Maimonides' work as an attempt to crystallize into unchangeable law the fluctuating streams of tradition. The same objection was made to his attempt to formulate into a creed the purely theological ideas of the Judaism of his day. His 'Thirteen Articles' brought on a war of strong opposition; and though in the end, the fame of their author conquered a place for them even in the Synagogue Ritual, they were never accepted by the entire Jewry. They remained the presentation of an individual scholar.

But his chief philosophical work, his 'Guide of the Perplexed' (Dalālat al Hāirin), carried him still further; and for centuries fairly divided the Jewish camp into two parties. The battle between the Maimonists and anti-Maimonists waged fiercely in Spain and Provence.

In the 'Guide of the Perplexed' Maimonides has also produced a work which was «epoch-making» in Jewish philosophy. It is the best attempt ever made by a Jew to combine philosophy with theology. Aristotle was known to Maimonides through Al-Farâbi and Ibn Sînâ (Avicenna); and he is convinced that the Stagyrite is to be followed in certain things, as he is that the Bible must be followed in others. In fact, there can be no divergence between the two; for both have the same end in view,—to prove the existence of God. The aim of metaphysics is to perfect man intellectually; the same aim is at the core of Talmudic Judaism. Reason and revelation must speak the same language; and by a peculiar kind of subtle exegesis —which provoked much opposition, as it seemed to do violence to the plain wording — he is able to find his philosophical ideas in the text of the Bible. But he is careful to limit his acquiescence in Aristotle's teaching to things which occur below the sphere of the moon. He was afraid of coming into contact with the foundations of religious belief, and of having to deny the existence of wonders. The Bible teaches that matter was created, and the arguments advanced in favor of both the Platonic and Aristotelian views he looks upon as insufficient. The Jewish belief that God brought into existence not only the form but also the matter of the world, Maimonides looks upon much as an article of faith. The same is true of the belief in resurrection. He adduces so little proof for this dogma that the people of his day were ready to charge him with heresy.

Maimonides is able to present 25 ontological arguments for his belief in the existence, unity, and incorporeality of God. What strikes one most is the almost colorless conception of the Deity at which he arrives. In his endeavor to remove the slightest shadow of corporeality in this conception, he is finally led to deny that any positive attributes can be posited of God. Such attributes would only be «accidentia»; and any such «accidentia» would limit the idea of oneness. Even attributes which would merely show the relation of the Divine Being to other beings are excluded; because he is so far removed from things non-Divine, as to make all comparison impossible. Even existence, when spoken of in regard to him, is not an attribute. In his school language, the «essentia» of God involves his «existentia.» We have therefore to rely entirely upon negative attributes in trying to get a clear concept of the Deity.

If the Deity is so far removed, how then is he to act upon the world? Maimonides supposes that this medium is to be found in the world of the spheres. Of these spheres there are nine: «the all-encompassing sphere, that of the fixed stars, and those of the seven planets.» Each sphere is presided over by an intelligence which is its motive power. These intelligences are called angels in the Bible. The highest intelligence is immaterial. It is the *noûs poietikós*, the ever-active intellect. It is the power which gives form to all things, and makes that which was potential really existent. «Prophecy is an emanation sent forth by the Divine Being through the medium of the active intellect, in the first instance to man's rational faculty and then to his imaginative faculty. The lower grade of prophecy comes by means of dreams, the higher through visions accorded the prophet in a waking condition. The symbolical actions of the prophets are nothing more than states of the soul.» High above all the prophets Maimonides places Moses, to whom he attributes a special power, by means of which the active intellect worked upon him without the mediation of the imagination. The psychological parts of the ‹Guide› present in a Jewish garb the Peripatetic philosophy as expounded by Alexander of Aphrodisia. Reason exists in the powers of the soul, but only potentially as latent reason (*noûs hûlikos*). It has the power to assimilate immaterial forms which come from the active reason. It thus becomes acquired or developed reason (*noûs epiktêtos*); and by still further assimilation it becomes gradually an entity separable from the body, so that at death it can live on unattached to the body. In ethics Maimonides is a strong partisan of the doctrine of the freedom of the will. No one moves him, no one drives him to certain actions. He can choose, according to his own inner vision, the way, on which he wishes to walk. Nor does this doctrine involve any limitation of the Divine power, as this freedom is fully predetermined by the Deity. But Maimonides must have felt the difficulty of squaring the doctrine of the freedom of the will with that of the omniscience of God; for he intrenches himself behind the statement that the knowledge of God is so far removed from human knowledge as to make all comparison impossible. Again, in true Aristotelian style, Maimonides holds that those actions are to be considered virtuous which follow the golden mean between the extremes of too much and too little. The really wise man will always choose this road; and such wisdom can be learned; by continued practice it can become part of man's nature. He is most truly virtuous who has reached this eminence, and who has eliminated from his own being even the desire to do wrong.

The daring with which Maimonides treated many portions of Jewish theology did not fail to show its effect immediately after the publication of the ‹Guide.› His rationalistic notions about revelation, his allegorizing interpretation of Scripture, his apparent want of complete faith in the doctrine of resurrection, produced among the Jews a violent reaction against all philosophical inquiry, which lasted down to the times of the French Revolution. Even non-Jews looked askance at his system. In Montpellier and in Paris, his own Jewish opponents, not content with having gotten an edict against the use of the master's writings, obtained the aid of the Church (for the ‹Guide› had been translated into Latin in the 13th century), and had it publicly consigned to the flames. But all this was only further evidence of the power which Maimonides wielded. The Karaites copied it; the Kabbalah even tried to claim it as its own. Many who were not of the House of Israel, as Thomas Aquinas and Albertus Magnus, acknowledged the debt they owed the Spanish rabbi; and Spinoza, though in many places an opponent, shows clearly how carefully he had studied the ‹Guide of the Perplexed.› Consult Yellin and Abrahams, ‹Maimonides,› and the authorities there mentioned.

Gustav Gottheil.

Main, mān, **Hubert Platt,** American composer and editor: b. Ridgefield, Conn., 17 Aug. 1839. He was educated in the public schools and for 45 years has been editor of song collections and other publications for church use, besides composing many hymns. He has also published 'A Dictionary of American Musicians and Poets.'

Main, mān (Ger. mīn), or **Mayn**, a river of Germany, which has its source in the northeastern part of Bavaria, about 13 miles northwest of Baireuth. It flows northwest to the border of Bavaria, and then makes a succession of remarkable zigzags, continuing, however, in a westerly direction, till it reaches the border of the grand-duchy of Hesse, which it enters. It then flows circuitously west, partly forming the boundary between Hesse and the Prussian province of Hesse-Nassau, and joins the Rhine a little above the town of Mainz, after a course of over 300 miles. The principal cities which it passes are Würzburg, Aschaffenburg, and Frankfort. It is navigable for about 200 miles, and by improvements the largest Rhine steamers can ascend to Frankfort. By means of King Ludwig's Canal it affords through navigation to the Danube.

Maine, mān, Sir **Henry James Sumner**, English jurist: b. Caverham Grove, Oxfordshire, England, 15 Aug. 1822; d. Cannes, France, 3 Feb. 1888. He was educated at Cambridge, where he was professor of Civil Law 1847–52. In 1852 he became reader on Roman law at the Inns of Court, London, and ten years later went to India where he was legal member of the council 1862–9. On his return, in 1869, he was appointed professor of jurisprudence at Oxford, 1869–78, and held this post till 1878. He was master of Trinity Hall, Cambridge, 1877, and professor of international law at Cambridge, 1887–88. Among his more noted works were: 'Roman Law and Legal Education' (1856); 'Ancient Law' (1861), an epoch-making book; 'Village Communities' (1871); 'Popular Government' (1855). Consult: Duff, 'Sir Henry Maine: a Brief Memoir of his Life' (1892).

Maine de Biran, François Pierre Gonthier, fräṅ-swä pē-är gŏn-tē-ä män dė bē-rōṅ, French philosopher: b. Bergerac (Dordogne) 29 Nov. 1766; d. Paris 16 July 1824. He entered the Life Guards of Louis XVI. in 1784, was present at Versailles on 5–6 Oct. 1789, but was not concerned in the Revolution. He opposed Napoleon in the latter part of his reign, and became a legitimist at the restoration. His chief philosophical essays are: 'Influence de l'Habitude' (1803); 'Sur la Décomposition de la Pensée' (1805); 'Sur l'Apperception Immédiate' (1807); and 'Rapports du Physique et du Moral' (1811). Maine de Biran's importance as a philosopher is chiefly due to his giving the direction to philosophic speculation afterward developed in the school founded by Victor Cousin.

Maine (name given as early as 1622 to distinguish the *mainland* from the islands. It was called in the Mason and Gorges Patent, "the Mayn Land of New England," and in the great charter, "Province of Maine"), one of the New England group of North Atlantic States and the most easterly State of the Union. It is between lat. 43° 6′ and 47° 27′ 33″ N. and lon. 66° 56′ 48″ and 71° 6′ 41″ W. The 45th parallel crosses the State within 30 miles of its geographical centre. This position, almost precisely equidistant between the equator and the pole influences the water-power of the State in an important degree, and chiefly through its meteorological conditions. It is bounded on the north by Quebec and New Brunswick, provinces of Canada, on the east by New Brunswick and the Atlantic Ocean, on the south by the Atlantic, and on the west by the State of New Hampshire and the Province of Quebec. Its greatest extent is from north to south; its greatest length about 303 miles and its greatest width about 212 miles; area 31,500 square miles, of which 3,000 square miles are water surface. Maine is within 385 square miles of being as large as all the rest of the New England group, and is the 35th in size among the States of the Union.

Topography.—The northeastern and southwestern boundaries are straight lines except a portion of the extreme southwestern boundary. The northern, northwestern, and southeastern boundaries are irregular. The coast line is fringed by islands and indented by numerous bays, and in length, measured from Eastport to the southernmost extremity in a direct line, is about 226 miles; but Maine has really about 2,500 miles of sea coast. The coast from the eastern extremity to Penobscot Bay is high and rugged. The greater part of the coast of York County, in the southwest, is low.

There are two general mountain slopes in Maine, the highest part extending across the State from north of the source of the Megalloway River in the west, northeast to Mars Hill. South of the main divide is Mount Katahdin, 5,385 feet in height; Mount Abraham in the west, in Franklin County, is 3,387 feet high; Saddleback Mountain, 4,000 feet, and Mount Blue, 3,900 feet, are in the same county. Green Mountain on Mount Desert Island is 1,800 feet high, and is one of numerous peaks more or less conical in form, isolated or in clusters, comparatively bare of soil, and densely wooded about their bases. There is no long range of mountains in the State.

Hydrography.— That portion of the State north of the main divide is drained almost wholly by the Saint John River and its tributaries, and the part south of the main divide is drained chiefly by the Androscoggin, Kennebec, Penobscot, and Saint Croix rivers. The basin of Saint John River has an area of about 7,425 square miles. The head-waters of this river are in the northwestern part of Maine and the eastern part of Quebec, and it flows north by east for some distance past Saint Francis on the north to the extreme northeastern boundary, where it makes a turn and flows generally southeast through New Brunswick to the Bay of Fundy. The largest Maine tributaries of the Saint John are the Aroostook and the Allagash. The waters of a large number of the lakes of Maine find their outlet through the Saint John. The rivers south of the main divide flow generally south to the ocean. The source of the Kennebec is about 2,000 feet above the sea, of the Penobscot over 2,300 feet, of the Androscoggin about 3,000 feet, of the Saco in the southwest nearly 2,000 feet. They, together with their tributaries, are swiftly flowing streams, in many places passing over rocky beds which form rapids and falls and furnish extensive water-powers. The available water-power of the State has been estimated at nearly 3,000,00 horse-power. The flow of the tide is so great on the coast that it has been estimated "That with suitable wheels it can be operated sixteen hours out of the twenty-four." There are about 1,580 lakes in Maine, a large number of which are near the sources of the rivers. The surface of the lakes and rivers constitutes nearly one tenth of the whole area of the State. Moosehead Lake is the largest in the State. (For description of rivers, see separate articles.)

Geology.— The nature of the geological formation of Maine shows that it belongs to one of the oldest parts of the United States. The marks of the Glacial period may be plainly traced in several parts of the State; the changes in extent and form of the river beds and lakes are shown by the rock formation of the vicinity and the nature of the deposits which were brought from the mountains to the valleys. The northern portion of the State belongs to the Devonian period and the region about Penobscot Bay to the Silurian. In the southern part of the State are fossiliferous clays. There are a number of low ridges which evidently were once portions of mountain ranges, but which usually formed angles with the two great ranges that at one time extended across the State. Granite, slate, and marble exist in large quantities.

Soil.— The soil of the State shows the effects of the Glacial period as much as the rocks; the greater part of the surface is till and various forms of glacial debris. The old lake bottoms, now dry land, are largely alluvial and in these places the soil is very fertile. In such localities there are extensive agricultural lands.

Minerals and Mining.— Granite is one of the most important wealth producing minerals of the State. Along the coast and inland for some distance there are large areas of granite outcrop. It is found in such quantities near tide water that quarrying and shipping are comparatively easy and inexpensive. The feldspar and quartz are easily separated. Hallowell, Dix Island, Vinal Haven, and Freeport furnish the largest quantity. The Capitol at Albany, N. Y., and the Metropolitan Museum of Art, New York city, are built of granite from Hallowell. Crystalline limestone and marble are found in several places; in the southwestern part of the State the deposits are quite extensive. Slate of good quality is found in the central part of the State. It is quarried for table tops, blackboards, roofing and for mantels. The slate from Piscataquis County is remarkably pure, capable of being split into thin plates, and in color a deep blue-black. Silica and feldspar of an excellent quality are found in several places. Some of the products made in whole or in part from silica and feldspar are glass, porcelain, scouring soap, sandpaper, earthenware, and woodfiller. The silica is found in vein-quartz in some of the crystalline rocks. Tourmalin is found in Oxford County in large and beautiful crystals. Some of the other minerals are iron, copper, zinc, arsenic, manganese, tin, silver, gold, antimony, pyrites. and beryl. The annual value of the mineral output is about: granite, $1,000,000; limestone and marble, $1,000,000; slate, $180,000; silica, $50,000; other mineral products, $60,000, making the total amount for quarry purposes of about $2,600,000. Maine ranks second among the States in the output of granite; fourth in the output of slate and sixth in the output of limestone and marble.

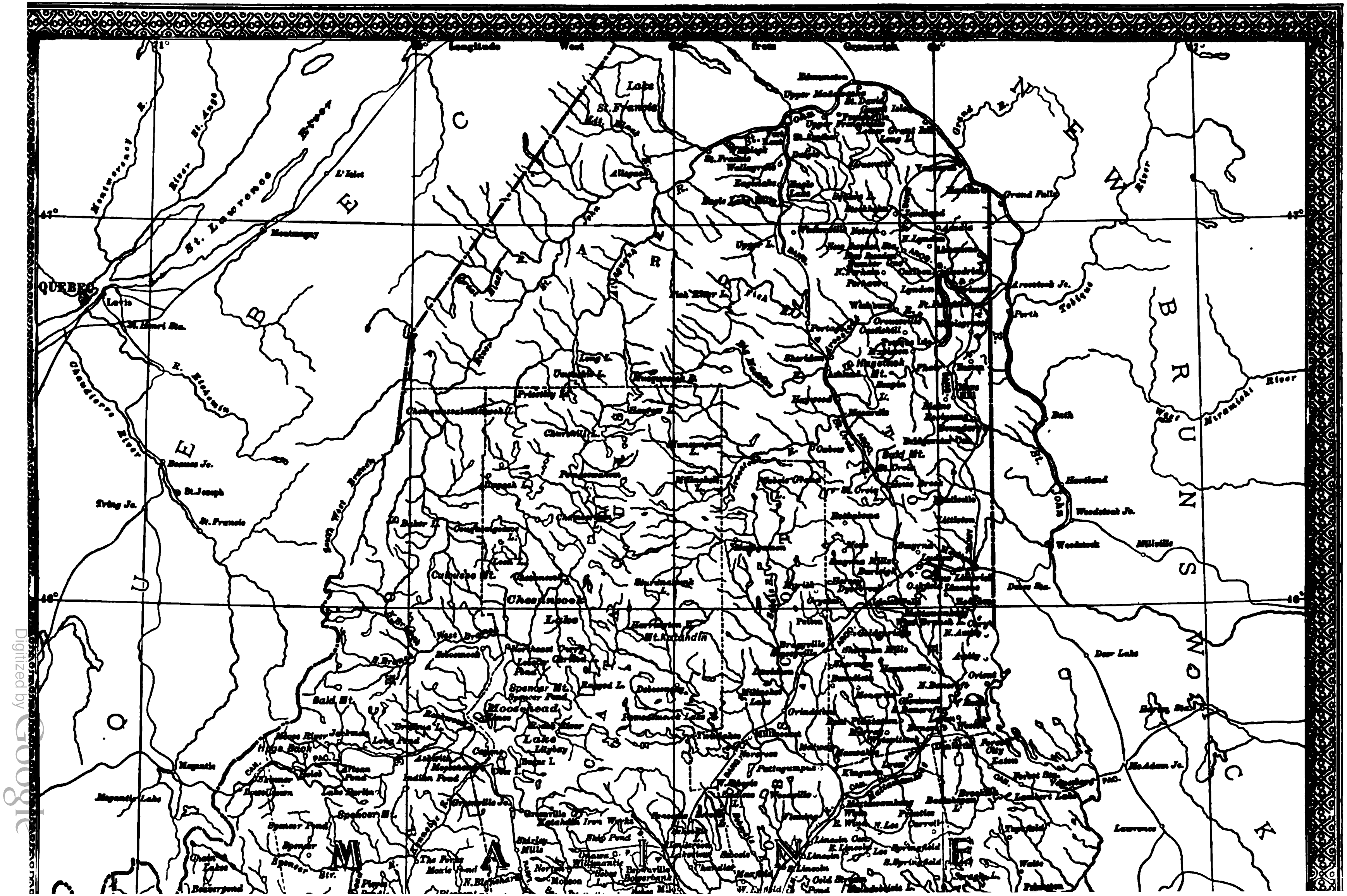
There are in the State nearly 30 mineral springs which are known and used; 10 of them are in Androscoggin County. The State reports about 30 springs with an output of about 1,850,000 gallons.

Climate.— The climate is cold a considerable part of the year; snow covers the ground from three to five months. The summers are short; in the southern part of the State there is not more, usually less, than five months for the maturing of crops. The extensive forests have been a protection, and with the good river drainage and the sea breezes have tended to make the climate most healthful. The mean temperature in January is 15° F.; in May 52°; in July 68°; in October 51°; in December 22°. The average temperature in the whole State is in summer 62.5° F. and in winter 20° F.

Flora.— The trees and plants common to the northeastern part of the United States flourish here. In the southern part are fine grasses, hardy fruits, and a varied shrubbery. The strawberry, blackberry, raspberry, blueberry, thorn-apple, and gooseberry grow in all parts of the State. (See *Forests* and *Agriculture.*)

Fauna.— Maine has a large number and variety of animals, among which are deer, moose, fox, beaver, sable, marten, mink, weasel, squirrel, rabbit, porcupine, and wildcat. Wild geese, ducks and teal are found in the vicinity of the lakes; fish-hawks and gulls on the coast; plovers, orioles, bobolinks and all the birds of other parts of New England are common. The lakes and rivers are filled with fish, and the coast fisheries are most valuable. (See *Fisheries.*)

Forests.— Maine is known as the "Pine Tree State" because of the large extent of pine forests which once existed within its limits. The majestic "mast pine," which the State once furnished for many ships, has almost become a thing of the past, yielding to the demands of commerce. The greater part of the State is covered with forests; about 65 per cent of the State's land area is woodland. The northern and central parts are forest; in the southern part along the coast and along the navigable streams the land is cleared and cultivated. Trees grow rapidly. Denuded tracts, unless cultivated, will soon send up an undergrowth which become trees of fair size in the course of a few years. Actual deforestation, except from forest fires, can never take place to any considerable extent in Maine, as the agricultural lands are very largely occupied. Nearly all the lumber of Maine used in the manufacture of pulp and paper has been taken from the drainage of the Androscoggin, Kennebec and Penobscot rivers, in the following proportions: 42 per cent from the Androscoggin; 33 per cent from the Kennebec; and 35 per cent from the Penobscot. Practically there has been none taken from the Saint John's River or from the southeastern portion of the State in Washington and Hancock counties, both being large wild land regions. The total average of these three systems from which the whole pulp lumber consumed in the State has been taken is about 4,741,000 acres, leaving more than one half the entire wild land region from which no pulp wood of any consequence has ever been removed. There


Longitude
West
from
Greenwich
71°
47°
46°
QUEBEC
Levis
Montmagny
St. Lawrence
River
St. Anne
Montmorency R.
L'Islet
St. Henri Sta.
R. Etchemin
Chaudiere River
Beauce Jc.
St. Joseph
St. Francis
Tring Jc.
Megantic
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Grand Falls
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Aroostook Jc.
Perth
Tobique
Miramichi River
Bath
Hartland
Woodstock Jc.
Woodstock
Millville
Debec Sta.
Deer Lake
Harvey Sta.
McAdam Jc.
Lawrence
St. John
Lake
St. Francis
Allagash
Fish River L.
Eagle Lake
Long L.
Chamberlain L.
Chesuncook
Lake
Mt. Katahdin
Moosehead
Lake
Spencer Mt.
Spencer Pond
Bald Mt.
Moose River
Jackman
Long Pond
Brassua L.
Indian Pond
Greenville Jc.
Lake Parlin
Spencer Pond
Houlton
Mattawamkeag
Millinocket
Lincoln
Kingman
Danforth
Vanceboro
Patten
Presque Isle
Caribou
Fort Fairfield
Ashland
Masardis
Portage
Sheridan
Oxbow
Smyrna Mills
Island Falls
Sherman Mills
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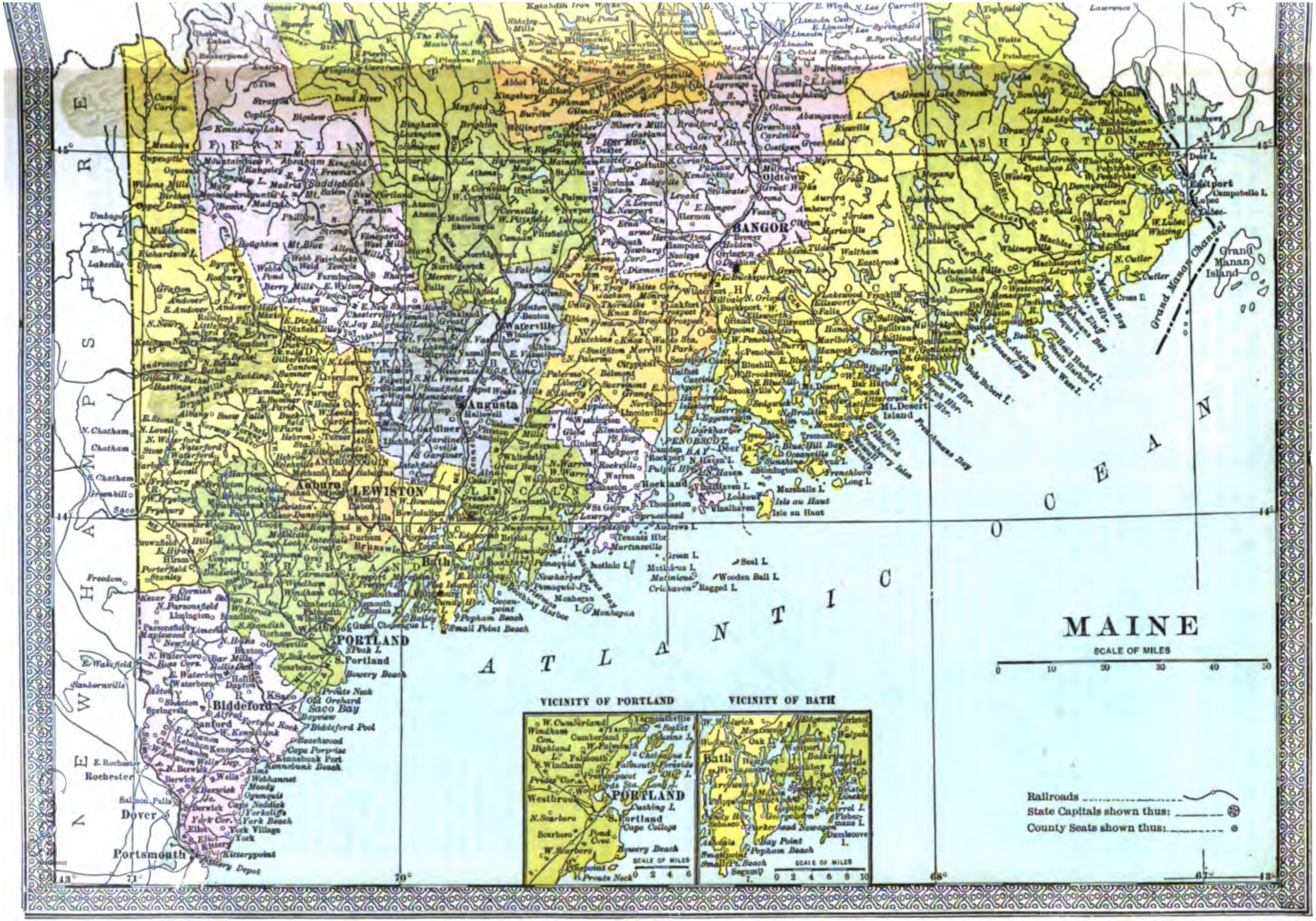
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0 10 20 30 40 50
Railroads
State Capitals shown thus:
County Seats shown thus:
VICINITY OF PORTLAND
VICINITY OF BATH
SCALE OF MILES
0 2 4 6
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ATLANTIC OCEAN
NEW HAMPSHIRE
FRANKLIN
WASHINGTON
HANCOCK
WALDO
KENNEBEC
LINCOLN
KNOX
CUMBERLAND
ANDROSCOGGIN
YORK
SAGADAHOC
PENOBSCOT BAY
Augusta
BANGOR
PORTLAND
LEWISTON
Auburn
Waterville
Bath
Biddeford
Saco
Gardiner
Rockland
Belfast
Ellsworth
Calais
Eastport
Machias
Oldtown
Brunswick
Skowhegan
Farmington
Kennebunk
Portsmouth
Dover
Rochester
Grand Manan Channel
Grand Manan Island
Campobello I.
Mt. Desert Island
Isle au Haut
Frenchmans Bay
Saco Bay
Monhegan
45°
44°
43°
71°
70°
68°
67°

was estimated standing in 1892, 21.239,000,000 feet of spruce alone, besides an almost equal quantity of pine, cedar, hemlock, poplar and various species of hard wood. The annual growth is considered sufficient to warrant the cutting of 637,000,000 feet of spruce timber each year, without depleting the supply, and as the pulp mills now established consume only about 275,000,000 feet of spruce per year, this leaves for saw-mill purposes about 362,000,000, if the annual increase alone is cut. The Forest Commissioner states that it is safe to reckon that there will be from 11,000,000 to 12,000,000 acres of land in the State that will be lumber producing for all time. Upwards of 35,000,000 feet of white birch timber are taken annually from Maine forests. The white birch area is a wide belt extending entirely across the State. Though used for many purposes its greatest utilization is by spool factories which produce about 800,000,000 spools, valued at more than $1,000,000. Besides being used in the production of spools a large quantity is shipped to Europe in spool bars. A variety of small articles are also manufactured from it, as baskets, furniture, office equipments, etc. The science of forestry is being employed extensively in the preservation of timber by private corporations.

Fisheries.— The rivers and lakes are well stocked with fish; the State is considered the sportsman's paradise. Some of the varieties are the speckled trout, sturgeon, pickerel, salmon, bass and bream. Lobsters, clams and mussels are in large quantities on the coast waters, and in the bays and inlets are bluefish, rock-cod, sculpins, cunners, flounders, and some others. In the off-shore waters there are cod, herring, mackerel, haddock, hake, porgy, menhaden, and pollock, which are caught in large quantities. One species of herring, the *Culpea harengus,* furnishes a large portion of the fish used in the sardine-canning establishments of Lubec, Eastport, and other places. The fisheries of Maine rank second in value among the fisheries of New England, but more men are engaged in this industry in Maine than in any other New England States except Massachusetts. The report of Commissioner of Sea and Shore Fisheries for 1908 gives the following statistics: persons employed, 6,861 (not packing, canning or wholesale); value of product, $3,256,581.

In 1892 the lobster fisheries product was $992,855, this amount being greater than for all lobsters in all the other New England States. The law passed in 1895, for the protection of the lobster fisheries greatly curtailed this branch of the fishing industry, as it prohibited the taking of lobsters less than 10½ inches in extreme length. This has caused the removal of canning establishments to Nova Scotia, N. B., and the Magdalen Islands. The government is at present planting large quantities of lobster fry along the coast. In 1901 15,000,000 and in 1902 37,100,000 were planted. Clam fishing ranks next in importance; canning clams is a prominent industry, also the preparation of smoked herring. Salmon fishing is largely in the Penobscot and Kennebec rivers. The fishery trade is centred chiefly at Portland, Rockland and Vinal Haven. The sardine fisheries are located in Washington, Hancock, Lincoln and Cumberland counties, and produced in 1902, $1,009,205. The following tables show the number of cases packed: 829,274 cases ¼ size, 353 cases ½ size in oil; 20,138 cases ¼ size, 337 cases ½ size, and 327,663 cases ¾ size in mustard; 1,156 cases ¾ size spiced and 247 cases ¼ size with tomatoes.

Agriculture and Stock Raising.— The soil of a considerable portion of the State is not adapted to agriculture, owing to the large acreage of forest land. But a little over 33 per cent is farm land and of that nearly one third is not improved. The most fertile lands are in the river valleys, the largest acreage being in the northeastern part of the State in the Aroostook basin. The farms average in size about 105 acres, and less than 5 per cent of the farms are occupied by tenants (Government Census Bulletin for 13 Dec. 1910). The owner living on the farm means more intensive methods of cultivation, a systematic enrichment of the soil, and a careful rotation of crops. The cereal crops, especially wheat, have decreased in extent owing to western competition, but in Aroostook County they are increasing. The Federal census of 1910 shows that in this county the cereals occupied one half the total of the cereal acreage of the State. The crop of oats, once large, has also decreased; yellow corn, formerly cultivated on all the farms, never occupied much area and is now raised principally for fodder. The finest sweet corn in the world is raised in Maine for canning, and goes to all parts of the country. There are about 50 canning establishments in the State.

Buckwheat, which produces excellent flour in a soil and climate like Maine, is still cultivated. The returns from the potato crop are greater than from all the cereals. Hay of an excellent quality is marketed at good prices. Farmers living near markets are giving considerable attention to market gardening and dairying. Fine grained vegetables, sweet corn, small fruits, and apples flourish and bring excellent returns. Apple orchards are increasing in number and increased attention is being given to their care and cultivation. The raising of horses is increasing, but the number of neat cattle, and sheep is decreasing. The number of milch cows is increasing. The statistics of 1900 show that nearly 30 per cent of the farms derived more income from dairy products than from all other sources. However such statistics are sometimes unreliable as a large part of the living of the farmer's family comes from the farm, but that only is reckoned as income which is sold from the farm. The amount received in 1900 for dairy products was about $5,605,000. The Federal Census Reports of 1910 give the following statistics: 59,773 farms, covering 6,291,000 acres, of which 3,933,000 acres were unimproved. The total value of the farm property of the State was $158,676,000. The value of the products for 1899 was $37,104.375. For the year ending 1 June 1910 some of the farm products were as follows:

			Value.
Hay,	1,750,000	tons	$22.400,000
Potatoes,	27,940,000	bushels	11 735,000
Oats,	5,554,000	bushels	2 666,000
Buckwheat,	748,000	bushels	509,000
Corn,	782,000	bushels	555,000
Barley,	248,000	bushels	188,000
Wheat,	267,000	bushels	272,000

In 1910 the farm animals were:

	Number.	Value.
Horses	107,574	$14,364,756
Sheep	206,434	813,976
Milch cows	156,819	5,874,228
Other cattle	99,704	1,910,156

Manufactures.— The extensive water-power has been a great aid in developing manufacturing industries. Ship-building was among the first manufacturing industries of the State. The first vessel built in Maine was the Virginia. She was built by the Popham Colony 1607–8, and under command of Captain James Davis sailed from Plymouth with the Somers and Gates Colony for Jamestown, 1 June 1609. Bath was the chief ship-building centre of the United States for over 100 years, and is yet a ship-building centre of importance. Prior to the construction of steel vessels, the Maine forests supplied a large amount of the timber used in ocean vessels built in the United States and fully half the ocean vessels of the nation, up to 1900, were made in Maine. Bath builds now many steel vessels. The manufacture of leather is another of the leading industries. The bark of the hemlock is used in large quantities for tanning. The manufacturing of cotton and woolen goods began the latter part of the 18th century and has been continued. Lewiston is the chief centre of cotton manufacturing. There is a tendency now to remove the cotton manufacturing industry to the Southern States or nearer the supply of raw material. Biddeford and Saco are extensively engaged in manufacturing cotton goods. Woolen mills are scattered throughout the State. The oil cloth industry was first started in Maine in 1845 by C. M. Bailey of Winthrop (q.v.). Nearly all the factories are located near the coast, or in localities where abundant water-power and good transportation lessen the cost of production and shipping. Lime and cement are important manufacturing products; large quantities of lime are made in Knox County. The following comparative table from the Federal census for 1900 will give some idea of the value of the manufacturing industries.

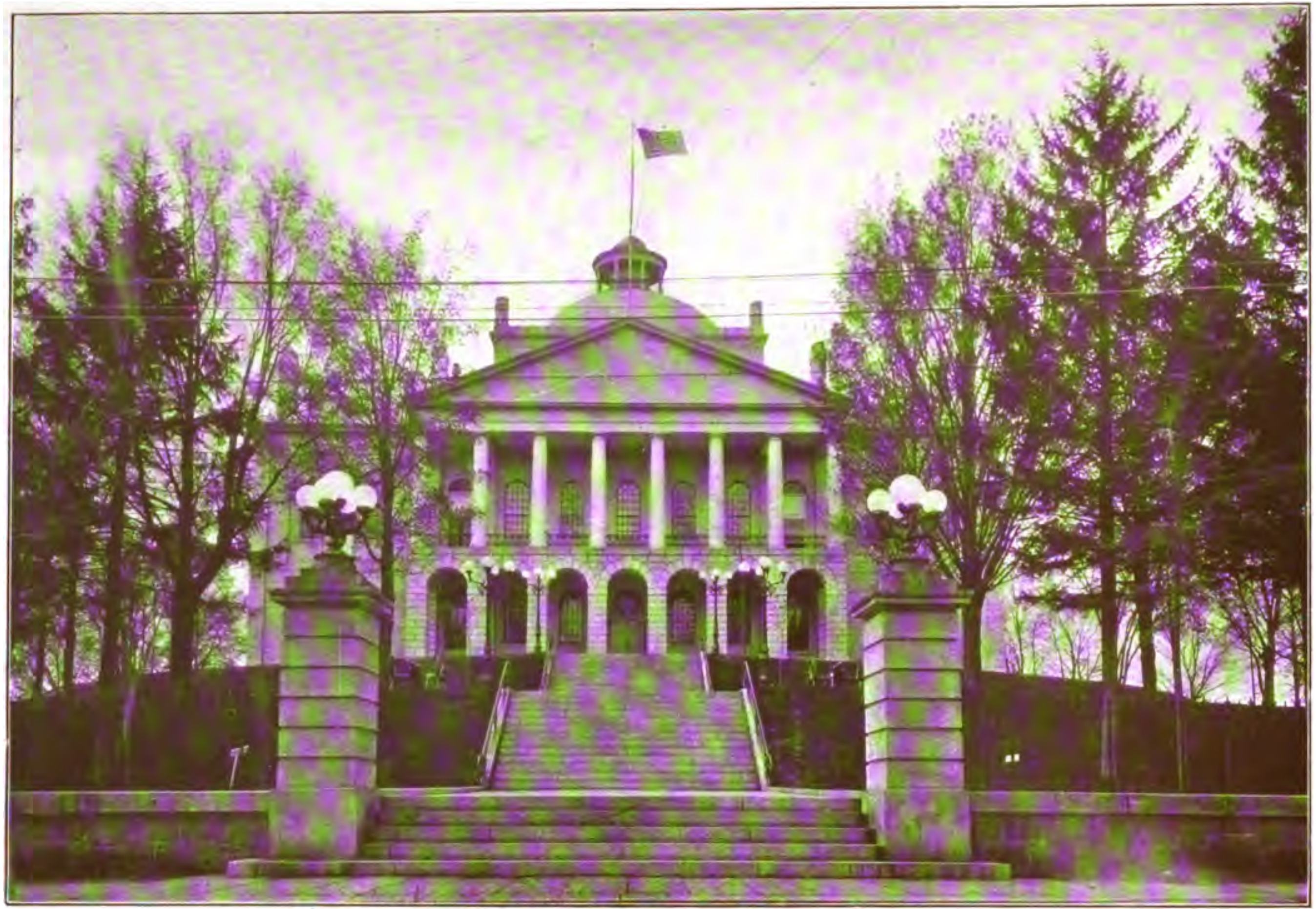
INDUSTRIES.	Year	Number of establishments	Capital	Value of products including custom work and repairing
Total for selected industries for State..	1900	1,689	$86,564,100	$73,368,312
	1890	1,580	56,706,127	54,631,124
Increase, 1890 to 1900	....	109	29,857,973	18,737,188
Per cent of increase	....	6.9	52.7	34.3
Per cent of total of all industries in State.	1900	25.2	70.4	57.6
	1890	31.5	70.5	57.1
Cotton goods	1900	15	21,087,190	14,631,086
	1890	23	20,850,754	15,316,909
Fish, canning and preserving	1900	117	8,481,056	4,779,733
	1890	35	527,420	1,660,881
Flouring and grist mill products	1900	227	1,235,767	3,399,832
	1890	210	1,194,900	3,254,690
Foundry and machine-shop products	1900	112	4,032,950	3,298,706
	1890	82	3,024,473	2,628,572
Leather, tanned, curried and finished	1900	31	1,376,106	2,451,713
	1890	51	2,231,702	3,363,672
Lumber and timber products	1900	838	15,764,538	13,489,401
	1890	894	12,978,315	11,849,654
Paper and wood pulp	1900	35	17,473,160	13,223,275
	1890	17	4,273,825	3,281,051
Printing and publishing, newspapers and periodicals	1900	120	1,140,152	2,190,017
	1890	105	1,315,820	1,719,477
Ship and boat building, wooden	1900	115	1,027,756	2,491,765
	1890	85	14,128,693	2,818,565
Wool manufactures	1900	79	9,456,830	13,412,784
	1890	78		8,737,653

Political Divisions.—Maine is divided into 16 counties, as follows: Androscoggin, Aroostook, Cumberland, Franklin, Hancock, Kennebec, Knox, Lincoln, Oxford, Penobscot, Piscataquis, Sagadahoc, Somerset, Waldo, Washington, York. Pop. (1900) 694,466; (1910) 742,371.

The principal cities of Maine are Portland, the metropolis, founded in 1632; Lewiston, Bangor, Bath, Augusta, Saco and Biddeford, each of which is treated in a separate article.

Banking Institutions.—There were in 1910 79 National banks doing business in this State, having 55,381 depositors and $15,992,938.44 savings deposits; 51 savings banks having 226,166 depositors and $87,409,607.71 savings deposits; and 35 loan and trust companies having 51,140 depositors and $15,376,527.36 savings deposits. Total number of banks in the State was 165, with 332,687 depositors and $118,779,073.51 savings deposits. Maine has no State banks or private banks (according to the "Statistical Abstract" of the United States of the Department of Commerce and Labor for the fiscal year

MAINE.



STATE CAPITOL AT AUGUSTA.

1909). The total assets of the above named institutions were considerably over $150,000,000.

The aggregate amount of exchanges at the local clearing-house in Portland for the year ending 31 Dec. 1909 was $90,287,000, a decrease of $4,000,000 below those of the previous year.

Finances.—The property value in 1910 as determined by the Board of State Assessors was as follows: real estate, $345,572,709; personal estate, $82,639,756; total, $428,212,465; tax rate, $2.08 on $1,000. State debt 1 Jan. 1910: bonded debt, $698,000. Its aggregate debts, 1902, were $15,046,819; combined fund and floating debt, $2,785,383.

Government.— The State Constitution, under which the laws of the State are administered was adopted by the people in town meetings, held throughout the State, December 1819. To amend or change the Constitution it is necessary to have in favor a two-thirds vote of both Houses of the Legislature and a majority of the votes cast at the next biennial election or meeting of the people. A voter must be a citizen of the State; that is, no one has the right of suffrage but males, 21 years or over, citizens of the United States, who have resided in the State, county, town, and voting district three months. Men of 21 years and over who are excluded from voting are, paupers, Indians who are not taxed, and persons under guardianship. Voters who are soldiers in the State militia or regular United States army may vote when serving outside the State. An amendment was made to the Constitution in 1884 to prohibit the manufacture and sale of intoxicating liquors. Severe penalties were attached to the violation of the law. State, city and town officials supervise the sale of liquors, and permit such sales only for medicinal, manufacturing, and mechanical purposes. The capital city is Augusta, on the Kennebec River in Kennebec County; its population in 1910 was 13,211; in 1900, 11,683.

Executive.— A plurality of the votes cast is necessary for the election of the Governor, who holds office for a term of two years. His council consists of seven members elected biennially on joint ballot of the Legislature, but any district prescribed for the election of senators can furnish only one councillor. The Governor and council have power to grant pardons, commutations, and reprieves, and to remit penalties. They also have the appointment of the judges of the Supreme Court. In case of vacancy in the office of governor, the President of the Senate and Speaker of the House are respectively in line of succession. The Secretary of State and the Treasurer are elected on joint ballot of the Legislature and for two years.

Legislature.— The Legislature is composed of a Senate and House of Representatives. There are 31 members of the Senate and 151 members of the House, all elected biennially on the second Monday in September. They meet in session on the first Wednesday in January next following their election. The Senators are elected from Senatorial districts into which the counties of the State are divided. The Representatives are elected from towns. All bills relating to revenues must originate in the House of Representatives. The House has power of impeachment; but the Senate conducts the trials of impeachments. The Legislature may overcome the Governor's veto by a two-thirds vote each of House and Senate. The State has four Congressmen.

Judiciary.— The eight judges who compose the Supreme Judicial Court are appointed for a term of seven years by the Governor and Council. The judge of the Superior Court of Cumberland County, which includes the city of Portland, the judges of the inferior courts, of municipal and police courts, are also appointed by the State executive and his council. The term of appointment of the judges of the inferior courts is seven years, and of the judges of municipal and police courts, four years. Probate judges are chosen by the people by election and for a term of four years. The attorney-general is elected on joint ballot of the Legislature and for a term of two years.

Local Government.— There is a general law providing for the election and duties of State, county, town, and city officers, and penalties for non-fulfilment of their duties. The county officers are, trial justices, county attorney, county commissioners, bail commissioners, judges of probate, sheriff, deputy sheriffs, registers of deeds, treasurer, clerk, commissioners of disclosure, stenographic commissioners, and coroners. The town officers are, selectmen, clerk, treasurer, collector of taxes, constables, road commissioners, school committees, health officer. Justices of the peace have jurisdiction throughout the State.

Militia.—The National Guard of the State numbers 1,382 organized militia, with 116 commissioned officers, and 14 general staff officers. The unorganized reserve militia numbers 103,375 men,—every able-bodied male citizen, aged 18 to 45, being included. The organized militia is both commissioned and enlisted.

Religion.—The denominations rank in numbers as follows: Baptist, 20,016; Protestant Episcopal, 4,800; Free Baptist, 12,963; Congregational, 21,483; Methodist Episcopal, 10,585; Universalist, 3,003; Unitarian, 4,500; Roman Catholic (population), 106,000; Lutheran, 1,445; Presbyterian, 423; Advent Christian, 5,000; Friends, 1,800; Swedenborgian, 173; Christian, 3,600; Disciples, 500; Church of God, 250. In 1900 there were 2,020 evangelical Sunday schools, with 13,600 teachers and officers and 111,290 pupils. Sunday schools are maintained in connection with all the Roman Catholic churches.

Education.—In 1909 the school population was 161,600; enrolment in public schools was 132,948; and average daily attendance 97,132; enrolment in parish schools 11,000. There were 4,218 buildings used for public school purposes, 6,447 teachers; school property valued at $4,699,475; receipts for the previous year $1,507,345, and expenditures $1,513,125. For the higher education there were 200 public high schools; 40 private secondary schools; 5 public and 2 private normal schools; Bowdoin College at Brunswick; Bates College at Lewiston; University of Maine at Orono; Colby College at Waterville; Westbrook Seminary at Deering; and Maine Wesleyan Seminary and Female College at Kent's Hill. There are academies at Hebron, Hampden, Lee, Bridgton, and other towns. The illiterate of 10 years and over were 5.1 per cent, but this per cent would have been lower if the test had been made from the standpoint of those who could read or write in any language. A law of 1821 required that not less than 40 cents per capita of all inhabitants should be raised annually for school purposes. A public school fund was created in 1828 by setting apart 20 townships of lands belonging to the State. Moneys received from the United States for claims for services rendered in the War of 1812 were set apart for educational purposes. The compulsory law which covers the ages from 7 to 15 is strictly enforced. The district system has been abandoned and, instead the town system is in use. Since 1873 the State has aided towns where free academic instruction is given to the pupils. This instruction may be given in a high school within the town, or, since 1889, the town authorities may arrange for the education of its pupils with a high school outside the town. The number of free high schools receiving State aid in 1901 was 211. State institutes or summer schools for teachers are maintained by the State under the supervision of the State superintendent. The Indians are well provided with schools. The teachers' examinations and certificates are uniform and are in charge of the State. Strong efforts are made to have all the teachers normal school graduates. In 1903 about 25 per cent of those teaching in the schools were normal graduates.

Charitable Institutions.— There is a National Soldiers' Home at Togus, a United States Marine Hospital at Portland, State Insane Asylums at Augusta and Bangor, Military and Naval Orphan Asylum at Bath. There is also a Law School at Bangor, a College of Pharmacy at Orono, and Agricultural Experiment Station, all connected with the University. There are State Normal Schools at Farmington, Castine, Gorham and Presque Isle. The State General Hospital, State Reform School, School for Deaf Mutes, Maine Medical School, and Eye and Ear Infirmary, Home for Aged and Indigent Women, Old Men's Home, two Orphan Asylums (Protestant and Catholic), Young Men's Christian Association and Young Women's Christian Association, all located at Portland. City Hospital at Augusta, Central Maine at Lewiston, Eastern Maine General Hospital at Bangor, also at Bar Harbor, Old Town, and Rockland. There are two hospitals, five orphanages, and one Home for the Aged, under the auspices of the Roman Catholic Church.

Penal Institutions.— The State prison is at Thomaston, the State Industrial School for Girls at Hallowell, and the State Reform School about two miles from Portland. Prisoners in the county jails and convicts in the State prison are obliged to work, and the products of their labor are sold in the markets. Contracts are sometimes made for the labor of prisoners in the jails of some of the counties. The work of the inmates of the reform school is usually on the farm and in workshops. The girls at the industrial school are taught domestic work and some trades.

History.— Maine is supposed to have been visited by the earliest explorers: Corte-Real in 1501, and Verrazano in 1524, reported a coast the description of which corresponds with that of Maine. Gomez in 1525 sailed along the coast and named the Penobscot River, Rio de las Gamas, or Stag River. Sir John Hawkins, the famous Elizabethan seaman, explored the coast in 1565, and Sir Humphrey Gilbert in the voyage which cost his life was on his way to the Penobscot region, then known as Norumbega, to settle a colony under a patent from Elizabeth. Bartholomew Gosnold, an Englishman (one of the founders of Jamestown, Va.), explored the coast in 1602, and Maine was visited by Martin Pring, in 1603, by De Monts in 1604, and by Weymouth in 1605. The first attempt to settle on the territory was made by the French under De Monts, who, having received a patent from the French king, planted a small colony on Neutral Island in the Saint Croix River in 1604. The first colony settlement attempted by the English was at the mouth of the Sagadahoc by George Popham and Raleigh Gilbert in 1607. A fort was erected and a number of buildings, and here the Virginia, the first vessel built in the country, was launched and subsequently formed one of the fleet of the Somers and Gates Colony in 1609. The colony at Sagadahoc was broken up by the death of Popham and great hardships endured by the colonists. They returned to England in the autumn of 1608. In 1613, French Jesuits established a mission on Mount Desert Island, but they were expelled by the English the next year. In 1614, the coast was visited by John Smith, who found a few scattered settlers around Pemaquid Bay and on the island of Monhegan, off the coast of that part of the State now included in Lincoln County. In 1616 Sir Ferdinando Gorges, "The father of American Colonization," who had sent Pring and Popham to Maine, sent his agent, Richard Vines, to Saco to remain during the winter to explore the country and test the climate. In 1620, the King of Great Britain made a division of the grand charter of 1606, and granted to the Plymouth Company in England the whole country lying between 40° and 48° N., and to the Virginia Company the southern portion of the original patent. On 10 Aug. 1622, Gorges received a patent of territory between the Merrimac and Kennebec rivers, and the next year sent his son Robert as Governor and Lieutenant-General of the country, accompanied by several councillors and a minister of the Church of England to establish worship. In 1629, another division of lands was made giving to Sir Ferdinando Gorges the country between the Piscataqua and Kennebec rivers, to which he gave the name of New Somersetshire, and the remainder to John Mason. The first court in the Province was convened by William Gorges, nephew of Sir Ferdinando, at Saco, 21 March 1636. Charles I. granted to Gorges in 1639 a charter under which in 1641 Gorges established the first chartered city in the United States, under the name of Gorgeana, and constituted it the capital of the province. What was then Gorgeana is now York. Its original name was Agamenticus. A fort was built here and efforts made to protect the people against the Indians. From 1630 to 1632, settlements were commenced in Saco, Biddeford, Scarboro, Cape Elizabeth, and Portland, all of which continued to prosper till the Indian War of 1675, when they were overthrown. Massachusetts claimed a portion at least of the territory of Maine on the ground that its charter included the lands as far north as three miles above the source of the Merrimac; but those to whom other charters had been given resented her interference. In 1677, Massachusetts purchased from the heirs of Gorges all their interest in the Province of Maine. A new charter, issued by William and Mary, in 1691, combined the provinces of Massachusetts, Plymouth, Acadia, Maine, and Sagadahoc into one province, called «The Royal Province of Massachusetts Bay.» Maine was now a part of Massachusetts. Remote from the centre of white settlements of any great size, Maine suffered from attacks by Indians, especially during the French and Indian wars. When King Philip's War was ended there were within its boundaries only five settlements.

Among the first soldiers in active service in the Revolutionary War were men from Maine, who fought as Massachusetts troops. A regiment from Maine was present at Bunker Hill. The British fleet, in 1775, attacked and destroyed Portland and Falmouth. Off Machias was fought the battle in which the Margaretta, a British ship, was captured. At the close of the War Massachusetts still retained possession of the country and called it the «District of Maine.» The people of Maine were divided in their allegiance to Massachusetts, one party desired to remain a part of the «Bay State» and another party wanted independent statehood. The separatist movement gained ground during the War of 1812. Maine was admitted into the Union as a State 15 March 1820.

The northeastern boundary continued a source of dissension with Great Britain, or between the people of Maine and New Brunswick until after the ratification of the Ashburton Treaty (q.v.), which practically settled the eastern boundary between the United States and Canada.

The lumbering industry has always been most important, and since 1888–90 there has been a considerable development of manufacturing industries. The legislation of the State has been marked by conservatism and sound judgment. In 1851 Maine adopted a prohibitory liquor law which has since been embodied in the constitution of the State. During the Civil War Maine furnished 70,107 soldiers, of whom 9,398 died during the War and a large number returned to their homes disabled invalids.

The State went Democratic at State elections (except 1840) till 1855, when Anson P. Morrill was elected governor as the candidate of the «Know-Nothing» party and also of those who favored a prohibitory law. Since 1856 its elections have gone Republican except in 1878 and 1880, when the Democrats and Greenbacks on a fusion ticket elected their candidates. In 1879 a dispute arose as to the legality of the election of some of the members of the legislature and of the governor. For a time a disturbance was feared, but the militia preserved peace until the Supreme Judicial Court rendered a decision making the Republican candidates legal members of the legislature. The State has had no serious internal troubles except the «Know-Nothing» agitation in 1854–6, and the dispute about the legislature in 1879. The Australian ballot law was passed in 1891.

Since Maine became a State there have been 39 different governors, some of whom have held the office for more than one term.

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JAMES PHINNEY BAXTER (A.M., LITT.D.).

Maine, France, an old province having Normandy on the north, Brittany on the west, and Anjou and Touraine on the south, and Orléannais on the east. In corresponded to the modern departments of Sarthe and Mayenne.

Maine, University of, The, is a coeducational institution, located at Orono, Maine, on the Penobscot River, eight miles above Bangor. It is one of the institutions that owes its existence to the Act of Congress of 1862, commonly known as the Morrill Act. The 210,000 acres of land which were, by this act, conveyed to the State for the purpose of establishing a college of agriculture and mechanic arts, were sold at a low price, and there resulted an endowment for the college of $118,300. The income of the institution is derived from interest on this endowment fund and on other bequests of private nature, an annual appropriation by the State, student fees, and the income of the second Morrill Act of 1890. The total income from all sources for the year 1904, exclusive of special appropriations for buildings, was about $90,000.

The legislature of Maine accepted the grant of land in 1863, but the college was not opened to students until the autumn of 1868. During the years intervening between the acceptance of the government grant of land and the formal opening of the institution there was much excited discussion in the State as to the manner in which the grant of land should be utilized. Each of the three classical colleges already existing in the State was willing to establish an agricultural and mechanical department if it could secure the income from the fund. The matter was settled in 1865 by the legislature constituting a corporate body to be known as «Trustees of the State College of Agriculture and the Mechanic Arts.» Each county in the State had a representative on the board of trustees, and the president of the board was Hon. Hannibal Hamlin, Vice-President of the United States at the time of the passage of the land-grant act. Thus was begun the organization of a new institution, unhampered by tradition. Over the location there arose so bitter a controversy that after Orono was determined upon as the seat of the new college, the board, at its own request, was legislated out of office and an entirely new board of seven members was created. From the day of opening, in 1868, when twelve students enrolled themselves, the institution has prospered. Until 1897 the institution was known by the name "State College of Agriculture and Mechanic Arts." The legislature of 1897 changed the name to "The University of Maine." The most rapid progress has been noticed since the change of name. The University of Maine includes all that there was in the Technical College and appeals also to a broader constituency. The number of students (1910) is 845.

Although the institution is by law co-educational, the number of female students has never exceeded 30 at any one time. This is accounted for by the fact that the technical course attract large numbers of young men, and that there are two other colleges in the State which admit women. The faculty number 99. There are 23 departments in which instruction is given. These departments are divided into colleges of Arts and Sciences, Agriculture, Technology, Pharmacy, and Law. The degree of B.A. is given for the completion of such courses in the Colleges of Arts and Sciences as contain a minimum of one year of Latin. The degree of B.S. is given for all other courses in the Colleges of Arts and Sciences, of Agriculture, Technology, and Pharmacy. The degree of LL.B. is given those who graduate from the College of Law.

In the College of Arts and Sciences instruction is given in the departments of Greek, Latin, Romance Languages, Germanic Languages, English, Philosophy, Civics, History, Mathematics and Astronomy, Physics, Chemistry and Biology. In the College of Agriculture instruction is given in Agriculture, Animal Industry, and Horticulture. In the College of Technology instruction is given in Chemistry, Civil Engineering, Mechanical Engineering, Electrical Engineering, Mining Engineering, and Forestry. The colleges of Pharmacy and of Law are not subdivided.

Great interest is taken by the student body in all branches of athletics, and this interest is heartily approved by the faculty. Strong teams compete each year with those of other New England colleges, in baseball, football, basketball, tennis and track games. The students also maintain an excellent band, an orchestra, a glee club, banjo, guitar and mandolin clubs, and debating club. A noteworthy feature of student life at the University of Maine is found in the chapter houses of the various fraternities. Eight fraternities maintain elegant houses of their own, in which they live as families and frequently entertain their friends.

The Law School, located in Bangor, was established in 1898. It has an excellent library, maintains a three-year course, and has about 80 students, more than one third of whom are college graduates. George Emory Fellows,

President of the University of Maine.

Maine Boundary Treaty. The year 1910 witnessed the final settlement of the long standing dispute as to the boundary line between Maine and New Brunswick. Secretary of State Knox, acting for the United States, and Ambassador Bryce, on behalf of Great Britain, signed a treaty which establishes the exact boundary of Maine for all time.

At the close of the Revolutionary War in 1783 the first attempt was made to fix a satisfactory boundary, but it resulted only in hopeless dissatisfaction. Ever since that time the matter has remained one for ceaseless wrangling and dispute. Scarcely a diplomat has been sent to this country from England but has been called upon to familiarize himself with the Maine-New Brunswick boundary situation; while the state department of this country has gone over the ground so many times that that performance had almost come to be regarded as one of the regular duties of the department.

Most boundary lines are fixed by nature; those which are not do not as a rule amount to a great deal, and an amicable settlement can usually be reached at once. With the Maine-New Brunswick line, however, neither of these conditions have ever applied, particularly in that part which has so long been in dispute. This particular line runs through Passamaquoddy Bay, along the little islands at the mouth of the St. Croix River. As a result of its indefinite character there has been endless dispute and strife among the fishermen who frequent these parts; dispute which had had an industrial significance since both the Eastport and Lubec canneries have sent their men to this point, and it makes a vast deal of difference whether they are fishing in American or Canadian waters.

The source of all the trouble was the looseness with which the first treaty, that of 1783, was drawn up. Article II of that document reads:

"And that all disputes which might arise in future on the subject of the boundaries of the said United States may be prevented, it is herein agreed and declared that the following are, and shall be, their bounderies, viz.: From the northwest angle of Nova Scotia, viz.: That angle which is formed by a line drawn due north from the source of the St. Croix River to the Highlands; along the said Highlands which divide those rivers that empty themselves into the river St. Lawrence from these which fall into the Atlantic Ocean, to the northwesternmost head of the Connecticut River," etc.

Thus, while the St. Croix was plainly named as the beginning of the eastern boundary, the only point mentioned was the source of the river, and not a word was said about its mouth or the numerous islands of the great bay into which it empties. Moreover, there arose at once the questions as to what was the St. Croix River. The trouble loomed up at the very start. The first action toward a settlement was taken in 1794 when John Jay was charged to adjust the matter. All he was able to accomplish, however, was a provision in his treaty of that year for the appointment of three commissioners to determine just what was the St. Croix River. These commissioners met at Halifax in 1798 and determined the river, but neglected to mention its source and made no disposition of the islands at its mouth. Subsequently there were treaties, conventions and declarations between the United States and Great Britain relative to this subject in 1814, 1818, 1827, 1842, 1846, and in 1870, but in every instance there was something still left to be adjusted around the mouth of the river.

The treaty of Ghent in 1814 provided for commissioners to settle the matter and they decided that Moose, Dudley, and Frederick Islands belonged to the United States, while all the other islands, including Grand Menan, were the property of Great Britain. This was very good so far as it went, but it left unsettled the status of several small islands in the St. Croix and of the line itself through the bay. The channel thus remained in dispute.

In addition to this, trouble soon arose over the boundary line northward and westward from the source of the St. Croix. The original treaty had been exceedingly vague on this subject, and finally in 1827 the King of the Netherlands was named as referee to conclude the dispute. After failing for a long time to satisfy either party with any of his suggestions, he drew a line to suit himself, awarding part of the disputed territory to Maine and part to New Brunswick. The United States rejected this arrangement, while in the meantime the disturbances on the border kept becoming more and more serious. Operations of the 1830 census takers in the contested area created much feeling, and eight years later an American lumber dealer was thrown into jail by New Brunswick officials — the act having much to do with the precipitation of the Aroostook war. Although no blood was spilled in this it came very near maturing into a third war with England. A joint occupation was agreed upon as a temporary compromise, before Daniel Webster and Lord Ashburton came together in 1842 and drew up the famous treaty which settled all dispute as to that particular part of the boundary line.

It has been related as an historical fact that in these negotiations both nations withheld maps which were unfavorable to their claims. The Americans had one which had been discovered but a short while before in Paris, and was supposed to have been drawn up by Benjamin Franklin, while in the possession of the English was one made by Richard Oswald, who was one of the commissioners who negotiated in the treaty which gave the United States its independence. Later both nations showed these maps to their own people in evidence of how conclusively they had got the best of the bargain. Up to the present time, however, the United States has always regarded the signing of this treaty of 1842 as a diplomatic triumph.

The treaty of 1842, however, made no mention of any part of the boundary south of the monument which had been erected at the source of the St. Croix, and until Secretary Knox and Ambassador Bryce signed their treaty of 1910 the lower part of the line in places was still contested. But with the signing of this latest treaty and the final settlement of the whole chaotic matter no point now remains between the United States and Canada which is in the slightest dispute.

Maine, The. A battleship of the United States navy, mysteriously destroyed by explosion in Havana Harbor, Cuba, on the night of 15 Feb. 1898. The revolt of the Cubans in 1895 against Spanish misrule had brought the island in 1897-8 to the verge of ruin. General Weyler had been recalled and General Blanco was sent as Governor-General to endeavor to bring order out of chaos, but his plans failed and January, 1908, witnessed serious disturbances. The American government, believing the lives and property of American citizens in Havana in danger, the *Maine,* which had been for some time at Key West was ordered to Havana and arrived at that port 25 Jan. 1898. She was piloted into the harbor by an official pilot of the Spanish government and was moored to a government buoy. The usual official and international calls and salutations were exchanged between the Spanish authorities and the Commander of the *Maine,* Capt. Charles D. Sigsbee, and outwardly there was no evidence of the impending disaster. The *Maine* carried 26 officers and 328 men, all of whom were on board when the explosion took place, except an assistant engineer, two naval cadets, and a gunner. Two officers and 250 men were killed at once and 8 men died afterward in hospital. Only 16 of the crew wholly escaped injury. Of the dead, 166 were buried in Colon Cemetery, and 25 at Key West. In 1899 the dead buried at Colon Cemetery were brought to the United States and buried at Arlington with military and naval ceremonies.

A Court of Inquiry, Captain W. T. Sampson, presiding, was instituted and after a month's investigation expressed the opinion that the vessel was destroyed by the explosion of a submarine mine, but responsibility could not be fixed upon any person or persons. Shortly afterward war was declared. (See UNITED STATES — THE WAR WITH SPAIN.)

There was a very general demand throughout the United States that the *Maine* should be raised, and on 9 May 1910 Congress authorized operations and the matter was placed in charge of the War Department, and assigned specifically to the engineer corps of the army. An elliptical coffer-dam, composed of a series of huge contacted cylinders that were constructed of interlocking steel piles and filled with mud and stone, was planted around the wreck. It was a wonderful piece of engineering, reflecting great credit on every army engineer connected with its inception and execution.

The coffer-dam was completed 5 June, 1911, and the entire wreck exposed 2 November following. A joint army and navy board of which Rear Admiral Charles E. Vreeland was president, was then sent to Havana to reinvestigate the wreck. It reported 15 December, 1911, confirming the verdict of the Sampson Court except in the non-essential detail that the center of the explosion was a little farther aft than was reported by that court.

The after half of the hull, all that was not tattered, was floated 13 February, 1912, fourteen years, lacking two days, after the Maine's destruction. On 16 March, 1912, this relic of the once powerful battleship was towed to sea, with attendant ceremonies, afloat and ashore, and sunk in six hundred fathoms of water. Concurrently 34 coffins, estimated to contain the bones of 64 of the *Maine's* dead, were placed on board an American war vessel and despatched to Arlington, where, on 23 March, they were buried in the *Maine* plot.

Maintenon, Françoise d'Aubigné, frăn-swäz dō-bēn-yā măn-tē-nôn, MARCHIONESS DE, French queen: b. Niort, Poitou, 1635; d. Saint-Cyr, 1719. Her birthplace was the prison in which her profligate father and unfortunate mother were confined. From her father's death in her 10th year she was the poverty-stricken ward of her grudging guardian and aunt, Madame de Neuillant, who dressed her like a peasant and set her to guard the poultry. Yet her humiliation did not embitter her bright and cheerful disposition. The famous wit and man of letters, Scarron, deformed, old, and infirm as he was, became her husband, and she was soon the centre of the clever literary people who frequented his house. When Scarron died, her good sense and delightful disposition recommended her to many friends, who pointed her out to Louis XIV. as a fitting person to take charge of the education of the children born to him by Madame de Montespan. She undertook the office of governess to the royal children, won their affection and respect as well as that of the king, who married her in 1685, when she was 50 and he 47. There can be no doubt that she exercised a beneficent influence over the king's private life. She was undoubtedly disinterested and charitable, her character above stain in a profligate age, and her mind clear and resolute in pursuing the course she knew to be right. She survived the king four years and died at the nunnery which she had changed into a place of education for the poor daughters of decayed families, having enjoyed to the end all the honor and position of a royal widow. Consult: Noailles, 'Histoire de Mme. de Maintenon' (1848–58); Geffroy, 'Mme. de Maintenon d'après sa Correspondance authentique' (1887).

Mainz, mīnts, Germany, a town in the grand-duchy of Hesse-Darmstadt, on the left bank of the Rhine, opposite the mouth of the Main, 20 miles by rail southwest of Frankfort. It is a fortress of the first rank, an episcopal see, and a river port. The town rises gradually from the Rhine in the form of an amphitheatre. A railway bridge spans the Rhine a little above its junction with the Main, and a stone bridge connects with the opposite suburb of Kastel. A handsome quay, 330 feet wide, extends along the Rhine for a considerable distance, and large modern harbors have been constructed. The principal edifices are the cathedral, recently restored, a vast building of the 11th century; the former electoral palace, now containing the city library (180,000 vols.), picture-gallery, museum of Roman and Roman-German antiquities, etc.; the old collegiate church of St. Stephen, occupying the highest site in the town, the Church of St. Peter, the German House, or grand-ducal palace with the arsenal adjoining; the courts of justice, the government buildings, public hall, two new concert halls, central railway station, etc. One of the most interesting objects in the town is the house of Gutenberg which contained his first printing-office. A bronze statue of Gutenberg, by Thorwaldsen, stands in an open space near the theatre. The great open-air resort is the *Neue Anlage*, outside the gates, consisting of extensive public gardens, and commanding fine views of the town and surrounding district. The manufactures consist chiefly of leather, furniture, hardware, carriages, carpets, tobacco, beer, chemicals, musical instruments, gold and silver wares, machinery, soap, hats, etc. The trade, particularly transit, is extensive. The principal articles are Rhenish wine, corn, flour, oil, coal, and wood. Mainz owes its foundation to a Roman camp which Drusus pitched here. On the decline of the Roman power it was almost entirely destroyed, but was afterward rebuilt chiefly by Charlemagne, and became the first ecclesiastical city of the German empire, of which its archbishop-elector ranked as the premier prince.

Maipo, mī'poo, or **Maipu**, a river in Chile, having its rise in the Andes Mountains and flowing almost due west into the Pacific Ocean. It is 120 miles in length. The falls and rapids furnish valuable water-power, which has not been utilized to any great extent. The city of Santiago is a few miles north of the river. On 5 April 1818 was fought on the banks of the Maipo the battle which decided the independence of Chile.

Mair, mãr, **Charles**, Canadian writer: b. Lanark, Ont., 21 Sept. 1840; d. 1906. He was educated at Queen's University, Kingston, and entered journalism. He aided in quelling the Riel insurrections and was one of the organizers of the "Canada First" party. Among his works are: 'Dreamland and Other Poems' (1868); 'Tecumseh,' a drama (1886).

Maisonneuve, mā-zŏ-nėv, **Paul de Chomedey**, Sieur de, French colonizer: b. Champagne, France; d. Paris 9 Sept. 1676. He enlisted in the French army at 13 and later organized a band of colonists with whom he landed at Quebec in 1641. In 1642 he founded Montreal and was for 22 years its governor but was absent for a time in 1652 when he returned to France to conduct to America a new party of settlers. He displayed great administrative ability, but through the jealousy of De Mésy, governor-general of Canada, was in 1664 recalled to France by De Tracy. Though no charges were made against him he found no possibility of reinstatement in office and resigned in 1669.

Maistre, Joseph Marie, zhō-zĕf mä-rē māstr, Comte de, French philosopher and savant: b. Chambery 1 April 1754; d. Turin 26 Feb. 1821. He was of French extraction and was a senator of Piedmont at the time of the French invasion (1792). He left his country in consequence of that event, and afterward followed his king to Sardinia. In 1804 he was sent ambassador to Saint Petersburg, and returned finally to Turin in 1817. De Maistre was familiar both with Greek and Latin literature, and his writings in French have obtained the highest praise of critics. He was a conservative in politics, religion, and philosophy, a supporter of absolute monarchy, and of the infallibility of the pope. His 'Mémoires politiques et Correspondance diplomatique' (1858), however, shows him in the light of a much more discerning and less uncompromising politician than his formal treatises, and indicates a large and liberal appreciation of the revolution which he opposed. As a diplomatist he exerted himself to effect the restoration of all his former possessions to his master, and to obtain the transfer of Genoa. Among his political writings are his 'Eloge de Victor Amadée III.'; 'Considérations sur la France' (1796); 'Essai sur le Principe Générateur des Constitutions politiques’ (1810), in which he maintains the divine origin of sovereignty; ‘Soirées de St. Petersburg’; ‘Du Pape’ (1819); ‘De l’Eglise gallicane’; and ‘Du Congrès de Rastadt’ (the last with the Abbé de Pradt).

Maisur, mī-soor′. See MYSORE.

Maitin, José Antonio, hō-sā′ ăn-tō-nē′ō mī′tăn, Venezuelean poet: b. Porto Cabello 1798; d. Choroni, Venezuela, 1874. In 1824 he returned from Havana to his own country whence he had fled on account of persecution, and made his home in the valley of Choroni. In 1844 his best poems were collected and published with the title ‘Echoes from Choroni,’ and in 1851 a collected edition of all his works appeared.

Maitland, māt′land, **Frederick William,** English historian: b. England 28 May 1850; d. 21 Dec. 1906. He was graduated from Trinity College, Cambridge, and studied law; in 1884 was made reader of English Law at Cambridge and from 1888 was professor of the same branch there. He read widely on legal history and was a generally recognized authority. Among his works are: ‘Gloucester Pleas’ (1884); ‘History of English Law,’ with F. Pollock (1895); ‘Canon Law in England’ (1898); ‘English Law and the Renaissance’ (1901); etc.

Maitland, J. A. Fuller. See FULLER-MAITLAND, J. A.

Maitland, Sir Peregrine, British soldier: b. Hampshire, England, 1777; d. London 30 May 1854. He enlisted in the army in 1792 and was promoted rapidly, serving in Spain and at the battle of Waterloo, where he was a major-general. In 1818 he was appointed lieutenant-governor of Upper Canada and in 1828–34 was governor of Nova Scotia. He was made lieutenant-general in 1830 and commanded the Madras army 1836–8. From 1843–6 he was governor-general at the Cape of Good Hope.

Maitland, Sir Richard, LORD LETHINGTON, Scottish poet and antiquary: b. Scotland 1496; d. Edinburgh 20 March 1586. He was educated at St. Andrews and was one of the great lawyers of his day, and although he became blind in 1560 was nevertheless made a member of the privy council, and in 1562 keeper of the great seal. His manuscript collection of early Scottish poetry is preserved at Magdalen College, Oxford, and his own poems were published by the Maitland Club of Glasgow in 1830.

Maitland, William, Scottish statesman: b. Scotland about 1528; d. Leith 9 June 1573. He was a son of Richard Maitland, Lord Lethington, and was educated at St. Andrews and on the Continent. He early entered political life and was interested in the Knox reform movement; in 1558 he was appointed secretary of state by Mary of Guise, and is commonly called “Secretary Lethington.” He was one of the commissioners who concluded the treaty of Berwick and in 1560 was speaker of the Scottish Parliament. He was one of Mary’s ministers on her return from France, but was suspected of having betrayed her to Queen Elizabeth. In 1563 Maitland conducted a prosecution for treason against Knox whom he had earlier supported, and 1565 he became lord of the sessions but was removed from office for implication in Rizzio’s murder; he was also connected with the murder of Darnley. He contrived Mary’s escape from Lochleven but fought against her at Langside. After the assassination of Moray he became the leader of the queen’s party and was active in her support. In 1571 he was attainted for treason by Parliament as a result of joining Kirkcaldy at Edinburgh, whom he encouraged to hold the castle until the last. He was taken prisoner at its surrender and died in prison. Consult: Skelton, ‘Maitland of Lethington and the Scotland of Mary Stuart’ (1887–8).

Maitland, Australia, town, in Northumberland County, in New South Wales; on the Hunter River; about 100 miles north of Sydney. It is connected by railroad with Newcastle, about 15 miles distant. The Hunter River divides the town into East and West Maitland, two distinct municipalities, West Maitland being the larger. The Hunter River frequently overflows its banks and floods the town and surrounding country. Although serious devastation results, the soil has been enriched by this flooding, and so fertile is this section that Maitland is called the “granary of New South Wales.” Grapes, grains, tobacco, and vegetables grow in abundance. Large coal fields are near the town. Considerable manufacturing is carried on, especially in West Maitland. Pop. about 12,000.

Maize. See CORN, *Indian.*

Majen′die, Sir Vivian Dering: b. Pipe Grange 18 July 1836; d. Oxford, England, 24 April 1898. He was educated at Leamington College, commissioned in the Royal Artillery in 1854 and first saw active service in the Crimean war, in which he won the medal with clasps, and the Turkish medal, and he achieved further distinction in the Indian Mutiny. He became captain of artillery in 1861, major in 1872, lieutenant-colonel in 1880 and colonel (retired) in 1882. He was created Commander of Bath in 1880 and Knight Commander in 1895. Was 10 years on duty at the Woolwich Arsenal and in 1871 attached to the Home Office as Inspector of Gunpowder Works under the Gunpowder and Nitroglycerin Acts. He was largely instrumental in passing the Explosives Act of 1875.

It was fitting then that after having had so wide an experience and displayed such thorough acquaintance with the subject, Maj. Majendie should, on the passage of the Act, have been appointed chief inspector. While in this office his investigations of dynamite outrages brought him most conspicuously before the public, his most important service to his country was in so drawing and enforcing the regulations in explosive works as to render employment in these factories among the less hazardous of occupations for British workmen while all mankind benefitted from the exhaustive examinations which he made into accidents arising in the manufacture and use of explosive substances and his admirable reports in which he traced out the causes and offered practical suggestions by which to prevent the recurrence of these disasters. His influence has extended far beyond the confines of his country. For his successful efforts to ameliorate the condition of man he takes rank with Davy, Jenner, Francis, Lister and Florence Nightingale. His monument is the 22 Annual and 50 Special Reports which bear his signature

as Her Majesty's Chief Inspector of Explosives. CHARLES E. MUNROE,
Professor of Chemistry, Columbian University.

Maj'esty (Latin, *majestas*). *Majestas*, in a collective sense, was used in republican Rome to signify the highest power and dignity, the attribute of the whole community of citizens, the *populus*. The *majestas* was also ascribed to the dictator, consul, and even senate, though in the case of the last the word *auctoritas* was used in preference. At a later period, under the Roman emperors, *majestas* was the name of the imperial dignity, whilst that of a magistrate was called *dignitas*. To kings the attribute of majesty was given much later. The courtiers introduced the title into France under Henry II. In the Treaty of Crespy (1544) Charles V. is styled *imperial*, Francis I. *royal majesty;* and in the Peace of Câteau-Cambrésis (1559) the titles of *most Christian and Catholic majesty* are found for the first time. In England Henry VIII. first adopted the title *majesty*. At present this title is given to all European emperors and kings.

Majol'ica (Ital. mā-yō'lĭ-kä), or **Maiolica** (from the Italian name of the island of Majorca, q.v.), a decorated, enameled pottery made in Italy from the 15th to the 18th century. Majolica is an earthenware manufactured from coarse clay paste and covered with a stanniferous glaze or enamel. It has sometimes been called «Raphael ware» from the fact that a number of the paintings on it were copied from the designs of that famous painter.

Ma'jor, Charles, American novelist: b. Indianapolis, Ind., 25 July 1856. He was educated in the public schools and studied law, establishing a practice at Shelbyville. He has contributed to various magazines and has published: 'When Knighthood was in Flower' (1898); 'The Bears of Blue River' (1900); and 'Dorothy Vernon of Haddon Hall' (1902).

Major, (1) in music, a term applied to imperfect concords, but chiefly to the interval of the third. It also denotes that one of the two modern modes in which the third is 4 semitones above the tonic or key note. (2) In military science, the major is a field officer ranking next below a lieutenant-colonel and above a captain. He has generally the command of a battalion, the exercises of which he superintends, and in action or on parade carries into effect the orders of his superior officer. The term in the French service has been superseded by that of *chef de bataillon*. A brigade major is an officer who performs for a brigade, or in garrison, the duties ordinarily discharged by a major in a regiment or battalion. A major-general ranks next below a lieutenant-general. In other cases, the term major, when applied as an epithet to the several denominations of men in an army, signifies the superior of the department; as sergeant major, the chief non-commissioned officer in a regiment, who assists the adjutant; drum major, the chief of the drum corps, etc.

Majorca, ma̤-jôr'ka̤ (Spanish *Mallorca;* Latin, *Balearis Major*), Spain, an island in the Mediterranean, the largest of the Balearic group; area, 1,420 square miles. It is about 120 miles distant from Spain. It is very irregular in shape, and deeply indented, particularly in the northeast.

Majuba (mā-joo'bā) **Hill,** an eminence in the extreme north of Natal, the scene of the defeat of 648 British troops, with the loss of their leader, Sir George Colley, by a superior force of Transvaal Boers, 27 Feb. 1881. The attack was unexpected, and the Boers found the British resting after a night march and a climb of eight hours. The loss of the Boers was about 130, of the British more than 200 in killed and prisoners, besides many wounded and some missing. To the British nation the name Majuba Hill became a synonym for disaster. The anniversary of this fight was marked by the success of Lord Roberts, commander of the British forces in the campaign of 1900, when he received the surrender of the Boer commander, Gen. Cronje.

Makaroff, Stepan Osipovich, Russian vice-admiral: b. in 1848; d. 13 April 1904. He entered the navy in 1864 and received rapid promotion for distinguished services. During the Russo-Turkish War 1877–8, he commanded the gunboat Grand Duke Constantine, and for a series of daringly successful attacks upon Turkish ports, which earned him the title of «the Cossack of the Sea,» he was promoted captain of the second rank, aid-de-camp to the late Tsar Alexander II., was decorated with the orders of Saint Vladimir and Saint George. and received a golden sword of honor. In 1881 he took part with the legion of Skobeleff in the capture of Geok Tepe in which Gen. Kuropatkin also figured prominently. The same year he commanded the cruiser Taman, the station guardship of the Russian embassy at Constantinople, and made a careful and complete study of the defenses of the Bosporus. In 1882–3 he was chief-of-staff of the offensive squadron in the Baltic under Admiral Chihacheff, Minister of the Navy. From 1891 to 1894 he was engaged in improvements of ordnance; among his inventions were the so-called cap guns possessing 20 per cent greater power of penetration into the newest superimposed armor; and the Ermak ice-breaker, the first of the ice-breaking vessels now used in Baltic and northern Asiatic waters. After the disastrous attack of the Japanese on the Russian fleet at Port Arthur in February 1904 Vice-Admiral Makaroff was sent to the Far East to direct the Russian naval operations, and arrived at Dalny 8 March. He repaired and converted the blockaded squadron into an active aggressive naval force, but on 13 April was lured out of harbor by a decoy squadron. Discovering the Japanese main fleet trying to intercept him he at once returned and was about to enter the harbor, when his flagship, the Petropavlovsk, was destroyed by one of the sunken mines laid by the Japanese across the passageway, and Vice-Admiral Makaroff, his guest Vasili Verestchagin (q.v.), the famous war-artist, 16 staff officers, and over 800 sailors perished.

Makart, māk'ärt, **Hans,** Austrian painter: b. Salzburg 28 May 1840; d. Vienna 3 Oct. 1884. He began his art studies in the Academy of Vienna. In 1859 he went to Munich, and painted in the studio of Piloty, under whose teaching (1861–5) he developed remarkable talent as a colorist. His earliest success was a Rembrandtesque picture of 'Lavoisier in Jail' (1862). His first work to gain him wide fame was his three-paneled picture, 'The Seven Deadly Sins' or 'The Plague in Florence,' which aroused a storm of adverse criticism, wonder and admiration in Paris and Germany. In 1869 the Emperor Francis Joseph built him a fine studio in

Vienna, and he produced his series of 'Abundantia' pictures, 'Fruits of the Earth'; 'Fruits of the Sea.' In 1873 followed the picture which attracted so much attention in the Exhibition of Philadelphia (1876) his 'Venice Doing Homage to Caterina Cornaro,' now in the National Gallery at Berlin. He traveled in the East during the winter (1875–6), and his Egyptian sketches materialized in his 'Cleopatra,' 'Antique Hunt on the Nile,' etc. His 'Entry of Charles V. into Antwerp' (1875–8) gained a medal at the Paris Exposition of 1878 and his 'Diana's Hunting Party' is one of the most successful of his larger paintings, combining superb coloring and modeling of the nude with grand landscape effect. It is in the Metropolitan Museum of New York and is most characteristic of the gorgeous sensuousness of a painter who woke the intellectualists of German art to a sense of color, and broke free from the traditions of a somewhat stiff and pedantic method, gaining in life and intensity what he sacrificed of academic correctness. Consult: Lützow, 'Hans Makart' (1886); Stiassny, 'Hans Makart und seine bleibende Bedeutung' (1886).

Mak'emie, Francis, pioneer of the Presbyterian Church in the United States: b. Rathmelton, County Donegal, Ireland, 1658; d. Accomac County, Virginia, 1708. He was a born missionary and zealot, and on being licensed by the Presbytery of Laggan sailed for the British West Indies, and began work in Barbados. In 1684 he sought a wider field in Maryland and organized the first Presbyterian congregation at Snow Hill, capital of Worcester County, Md. After 10 years' labor as an itinerant preacher in most of the Southern States he returned to England and induced two other ministers to accompany him back. He was the first moderator of the Presbytery of Philadelphia (1706), which he assisted in forming; and visited New York (1707), where he was imprisoned for preaching, though when brought to trial was acquitted of lawbreaking. Consult Briggs 'American Presbyterianism' (1885).

Malabar, măl-a-bär', British India, in the Presidency of Madras, in the southwest bordering on the Arabian Sea. A great portion is low land along the coast, rising abruptly at the east where it is bounded by the Western Ghats. The western part is intersected by long, narrow ravines, and the whole is covered with vegetation, in many place large forests. There are a number of tea and coffee plantations and a large amount of rice is raised. The principal towns are Cochin, Callicut, Tellicherri, Kananur, and Mangalore. The name Malabar is often applied to the whole extent of coast country from Cape Comorin as far north as Bombay.

Malabar Nightshade, a succulent edible vine. See Basella.

Malabón, Santa Cruz de, sän'tä crooth dä mä-lä-bōn', Philippines, a pueblo of the province of Rizal, Luzon, also known as Tambóbong. See Tambóbong.

Malabuyoc, mä-lä-boo'yŏk, Philippines, a pueblo of the province of Cebú, situated at the mouth of the Malutuoc River on the strait of Tañon, 60 miles southwest of Cebú, the provincial capital. Pop. 13,120.

Malacca, mạ-lăk'ạ. See Straits Settlements.

Malac'ca Cane, an erect, slender-stemmed palm (*Calamus scipionum*) which, when dressed, is of a brown color, sometimes mottled or clouded. It is used principally for walking-sticks, and is brought from Singapore and Malacca, but is chiefly produced in Sumatra.

Malacca, Strait of, the channel between the Malay Peninsula and the Island of Sumatra, extending from lat. 1° to about 6° N. Entire length, about 520 miles; breadth, varying from 25 miles to 250 miles.

Malachi, last of the Hebrew minor prophets: he was contemporary with Ezra, writing about 450 B.C. Malachi's work was supplementary to that of Nehemiah and Ezra, who were struggling to preserve the integrity of the nation by opposing intermarriage with the heathen and to maintain the purity and persistency of the temple worship by which alone priests and people could be kept together as holy to the Lord. The prophet begins his message by showing that Jehovah still loves and favors his own people in contrast to the visitation he had brought upon Edom. He condemns the neglect and moral perversion of the priests who despise and prove ungrateful to God by the profanity of their niggardly offerings. He only is a true priest who recognizes his covenant obligation to God, and whose life and service are in keeping with it. The shortcomings of the people are next dealt with. Their intermarriages with heathen women and their divorces are an abomination. The coming of God's messenger, then of God himself in judgment, is announced. The day of Jehovah is near; in which the righteous shall triumph and the wicked perish. The law of Moses must be observed, and the coming of Elijah expected as a preparation for that day. The book of Malachi is argumentative and practical. It is plain and convincing. The prophet startles his hearers by stating their own objections, and answering them. Thus contemporary moral and religious life are plainly depicted, in the language of rhetoric rather than of poetry.

Mal'achite, a native basic copper carbonate and hydrate, having the composition $CuCO_3.Cu(OH)_2$, crystallizing in the monoclinic system, but commonly occurring in massive form, or as an incrustation. It is brittle, and has a specific gravity of about 4, and a hardness of from 3.5 to 4. Malachite is commonly subtranslucent, with an adamantine lustre. It is beautifully green in color, often banded with other colors, and it occurs in many parts of the world, usually in connection with other ores of copper. Specially fine pieces are found in the Ural district, and at the Nizhni Tagilsk copper mines a deposit is known which contains at least half a million pounds of pure malachite. In the United States, the best known deposits are those of Arizona. Malachite has been much prized as a gem stone, and it is extensively used for panels, clock cases, table tops, and other ornamental work.

Malachy, Saint, Irish bishop: b. Armagh 1095; d. Clairvaux, France, 1148. He belonged to the noble family of O'Morgair, was educated by Iombar, an anchorite, and ordained priest in 1119. He afterward studied at Lismore, and returning to Armagh was chosen bishop of Down and Connor (1125). His subsequent election to

Armagh having been disputed (1129) he eventually returned to the less important diocese, and the last moments of his life were spent with St. Bernard, whose monastery he had visited for the purpose of meeting Pope Eugenius. The document known as 'Prophecy of Saint Malachy' containing a Latin motto for each of the popes, is not now considered to be his production. He was canonized in 1189. Consult: O'Hanlon, 'Life of Saint Malachy' (1859).

Malacol'ogy. See CONCHOLOGY.

Malacopterygii, măl-a̤-kŏp-tē-rĭj'ĭ-ī, or **Malacop'teri,** a group of fishes, in former systems of classification, including those with jointed and spineless or «soft» fin-rays. Compare ACANTHOPTERYGII; and see ICHTHYOLOGY.

Malacos'traca, one of the two primary divisions of the *Crustacea* to which all of the larger and more highly organized forms belong. The number of pairs of appendages and of segments is definite, the former being always 19 and the latter 19, except in the order *Leptostraca* which have also two abdominal segments limbless. The boundary between head and thorax is not always clearly defined but the two always comprise 13 segments, of which 5 almost always belong to the head; the abdomen has six limb-bearing segments and is terminated by the telson which is probably a seventh segment. The head bears a pair of eyes, usually stalked, two pairs of antennæ, a pair of crushing jaws or mandibles and two pairs of maxillæ, to which a pair of maxillipeds is sometimes added (*Arthrostraca*). Of the typically 8 thoracic segments from 1 to 3 bear maxillipeds and the remainder walking feet. In most cases the thorax is more or less completely covered by a carapace. The mode of development is varied, sometimes, as in the crayfish, it is direct, sometimes with a nauplius, but usually through the larval form called zoæa (see LARVA), which possesses paired eyes as well as a median eye, a swimming tail and usually 7 pairs of appendages. The subdivisions are:

- Order *Leptostraca* (*Nebalia*).
- Order *Arthrostraca*
  - *Amphipoda* (beach fleas).
  - *Isopoda* (wood lice).
- Order *Thoracostraca*
  - *Cumacea* (*Diastylis*).
  - *Stomatopoda* (*Squilla*).
  - *Schizopoda* (*Mysis*).
  - *Decapoda*
    - *Macrura* (lobsters and shrimps).
    - *Brachyura* (crabs).

Malade Imaginaire, mä-lăd ē-mä-zhē-năr, **Le,** a comedy in five acts by Molière. It was produced in Paris (1673), was the last work of its author, and the last in which, as Argan, he appeared on the stage. See MOLIÈRE.

Malaga, măl'a̤-ga̤, Sp. mä'lä-gä (ancient MALACA), Spain, capital of the province of Malaga; on a small arm of the Mediterranean; about 70 miles northeast of Gibraltar. It was a flourishing city under the Romans, and its long occupation by the Moors has left distinct marks in the older parts of the town; the Gibralfaro, or Moorish castle, on a hill overlooking the town, and considerable portions of the ancient fortifications, yet remain. Among the important buildings are the cathedral, a highly decorated structure in the composite style with a spire 300 feet high; the Episcopal palace, customhouse, and several hospitals and charitable institutions, etc. The manufactures consist chiefly of iron, the ore of which is obtained from rich mines in the vicinity; soap, cottons, linens, machinery, etc. The harbor is excellent and the trade is of importance, the principal exports being olive-oil, lead in bars, wine, and fruit, particularly raisins, oranges, and almonds. The climate is one of the mildest and most equal in Europe.

Malaga Wine, a sweet Spanish wine produced in the province of Malaga. It is one of the «muscatel» wines, and is rich, luscious, and full of body. See also WINES.

Malagas'y Subregion, a faunal division of the Ethiopian Region in Zoogeography which embraces Madagascar and some small neighboring islands. See MADAGASCAR; ZOOGEOGRAPHY.

Malakoff, mä'la̤-kŏf. See SEBASTOPOL.

Malampaya, mä-läm-pä'yä, a sound on the northwest coast of the province of Paragua, island of Palawan, Philippines; it is an arm of the China Sea, extending 24 miles from northwest to southeast, and from 3 to 6 miles wide. It is entirely landlocked, Tuluran island protecting it from the China Sea, and is entered by Blockade and Endeavor Straits. Its depth varies from 36 to 54 feet, it is free from sunken dangers to navigation, is one of the finest harbors in the Philippine archipelago, and has been suggested as one of the best locations for a naval station between Balábac and Manila.

Malanao, mä-lä-now', the name commonly given the Moros, especially Ilanos, who live on the shores of Lake Malanas, island of Mindanao. See PHILIPPINE ISLANDS.

Mal'aprop, Mrs., a character in the 'Rivals' of Sheridan. Like Shakespeare's Dogberry she is made to employ words of the same length, accent, and more or less similar vowel and consonantal value, interchangeably. Hence her well-known 'Allegory on the Banks of the Nile'; 'Derangement of Epitaphs'; 'A Barbarous Vandyke'; etc.

Malapteru'rus. See ELECTRIC FISHES.

Mälar, mä'lär, **Lake of,** Sweden, a lake running inland from the Baltic about 81 miles, with an average breadth of 13 miles and an area of 525 square miles. It contains upward of 1,200 islands. Its east end is closed by Stockholm, where its waters are poured into the Baltic by various channels, the difference of level being about six feet. It is surrounded by the populous districts of Stockholm, Nykioping, Upsal, and Westeras, and the shores are varied with bays and hills, woods, lawns, and cliffs, and are adorned with many castles, country-seats, and villas, including the royal palaces of Drottningholm and Gripesholm.

Malaria, an infectious disease due to animal parasites, and which is characterized by intermittent attacks of chills and fever, so-called intermittent fever, or a continued fever with remissions; or by a chronic malarial cachexia. Malaria is a disease which is very widely distributed. It is found throughout Europe, particularly in the more southerly regions, Italy and Spain, but is absent in the more northerly parts of the Continent, where the temperature prohibits the development of the mosquito, the chief carrier of the disease. In Asiatic countries, particularly in India, malaria is very frequent; and in Africa different types of malarial fever constitute a feature most obnoxious to colonization. In the United States, particularly in the Southern States, malaria prevails. Along the New England coast, where it at one time was very common, it has become much diminished in prevalence and in severity. The Pacific coast region is free from the disease, and the Northwest States are comparatively free. In the region of the Saint Lawrence River malaria is unknown.

In order to understand clearly the different forms of malarial fever, it is important to bear in mind that the different types are due to minute animal parasites which enter the blood, usually by the bite of one of a particular genus of mosquitoes (*Anopheles*). (See Mosquitoes and the Propagation of Disease.) The parasite develops after its introduction into the blood and, according to the individual type that is introduced, certain variations in the developmental history of the disease result. The parasites themselves, which are thought to be low forms of animal life, protozoa, develop, for the most part, in the red blood-corpuscles, and have many allies in the red blood-corpuscles of other animals, as frogs, fish, birds, monkeys, cats, etc.

These organisms were first clearly demonstrated by Laveran, a French army surgeon, in 1880, and his early observations were enlarged and amended by Golgi, Marchiafava and Celli, Manson and Ross, and a host of others. At the present time at least three forms of the parasite *Hæmatozoa malariæ* are known, the parasite of tertian fever, the parasite of quartan fever and the parasite of æstivo-autumnal fever. These parasites have two cycles of development, one taking place in the body of man, and the other in the body of the mosquito. Thus a patient with malarial fever infects a mosquito with a parasite which undergoes certain transformations within the body of the mosquito, and is then in turn introduced into the body of another patient, to cause typical attacks of fever according to the type of parasite introduced. Occasionally two different parasites are introduced into the patient's body, and a mixture of the two forms of the disease results.

The commonest form of malarial fever (the so-called chills and fever, or ague) is due to the tertian and quartan parasites. In these, after an unknown period of incubation, probably from 36 hours to 15 days, the patient has a feeling as though he were going to be sick, sometimes with headache, sometimes a feeling of lassitude and a desire to yawn and to stretch. Occasionally the patient has nausea and vomiting. At the same time the temperature has begun to rise and a chill commences. He begins to shiver, the face becomes drawn, thin, and cold, the body shakes, the teeth chatter, and the skin may be cold and blue, although the internal temperature is known to be gradually rising. After from 10 to 15 minutes, or perhaps a longer time, the chill is followed by a hot stage. The coldness of the surface disappears, and the face becomes congested and flushed, the skin is red, the pulse is full, and the patient may have a throbbing headache, with mental excitement. Thirst is excessive. Then the period of sweating begins, the whole body being covered with perspiration; the temperature drops, the headache disappears, and in an hour or two the paroxysm is over.

A number of variations from this typical form are known. In the tertian type of fever the chill and fever usually occur every other day. This is due to the fact that the cycle of development of the tertian parasite is about 48 hours and that the stage of full development of the parasite, or sporulation, which is more or less coincident with the attack, occurs at these times. Thus every third day the patient has an attack, hence the term "tertian." In the mixed infections, when two sets of parasites develop on alternate days, the paroxysms of chills, fever, and sweating may occur every day. In the quartan type of fever the cycle of development of the parasite is completed every fourth day. Mixed infections also occur in this form of the disease. In the northern United States these are the types of malaria which are more common, but below Mason and Dixon's line a much severer form of the disease is present. This is the æstivo-autumnal type, which gives rise to the so-called bilious remittent fevers and typho-malarial fevers of the South. In these the symptoms are extremely irregular. The paroxysms occur every 24 or 48 hours, and longer remissions are known. The length of the paroxysms is usually longer, lasting 20 hours, instead of 10 or 12 as in the tertian form; the onset of the disease is usually slow and gradual; and there may be no chill. Occasionally there is a continuous fever without much break, the temperature ranging from 102° to 103° F. Jaundice is not infrequent, and this, with the fever and a furred tongue and mental disturbance, often gives rise to the suspicion of typhoid fever. In the simpler types the patient may get well after ten days or two weeks without any special medication. The more severe forms may be fatal unless prompt diagnosis and medication are instituted. The diagnosis of malaria should always include an examination of the blood and the demonstration of the parasite. In the vast majority of untreated cases the parasite can be found. Occasionally, however, repeated examination fails to show it.

Treatment should be prophylactic as well as actual, and attention should be paid to the avoidance of infection no less than to care of the disease itself. Rigid protection of houses by means of screens to keep out the *Anopheles* is one of the most important procedures. Furthermore, it is highly essential that the mosquitoes themselves should be protected from the infection by screening all patients suffering from malarial fever. In order to do this the patient's couch should be surrounded by mosquito-netting, and all mosquitoes in the room of the malarial patient should be killed by means of pyrethrum-powder. Further measures for destroying malaria should be taken by draining off swamps and employing proper engineering methods in order to get rid of the mosquitoes themselves. The planting of swamps with leafy trees often dries them up, and thus prevents the formation of breeding places for mosquitoes. Finally the specific, quinine, should be used in all cases. It is a prompt and sure parasiticide, and in its varied forms can be used by almost every patient, despite individual idiosyncrasies.

In the consideration of some of the chronic forms of the disease a number of perplexing conditions are met. Thus, following constant exposure to malaria and repeated attacks of the disease, symptoms of anæmia, of breathlessness, swelling of the feet and ankles, bleeding in different parts of the body and enlarged spleen may be found. This is a type of infection known as malarial cachexia. It is found in southern countries, and should be distinguished from the cachexia due to various forms of intestinal parasites. See MOSQUITO; MIASMA; MICROSCOPY, CLINICAL.

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Malarial Fever. See MALARIA.

Malauec, ma-low'ek, a provincial language, used largely in commerce, in Luzon, Philippine Islands (q.v.).

Malay (mā-lā') **Archipelago,** also called the INDIAN, ASIATIC or EASTERN ARCHIPELAGO, and EAST INDIA ISLANDS, is the greatest group of islands, numerically and in extent, in the world. They are situated to the southeast of Asia between that continent and Australia, and extend between the meridians of 95° and 135° east, and the parallels of 11° south and 17° north, with the Indian Ocean on the west and the Pacific Ocean on the east. The archipelago is composed of the Sunda or Dutch East India Islands, Sumatra, Java, Flores, Timor, and the numerous adjacent smaller islands; Borneo, Celebes, the Molucca or Spice Islands and their several minor neighbors; and extending to the north includes the Philippine and Sulu Islands belonging to the United States. New Guinea was formerly included in the archipelago, but more properly belongs to Australasia. See separate articles on the various islands. Consult: Wallace, 'The Malay Archipelago' (1880).

Malay Peninsula. See STRAITS SETTLEMENTS.

Malay'an Bear, or **Sun Bear,** a small bear (*Ursus malayanus*), found in the Malayan Archipelago, Borneo, Sumatra, and Java. It is about 4½ feet in length; the fur is black, fading into brown on the nose which is remarkably broad and blunt. The chest bears a crescentic white mark, or, in the Bornean variety, an orange-colored, heart-shaped patch. It usually feeds on grains and fruits, and is very fond of honey, but occasionally indulges in animal food; and is said to attack man, when hard pressed.

Malayan Subregion, a faunal division of the Oriental Region, composed of the southern end of the Malay Peninsula and all the islands of the Malay Archipelago as far as the Philippines and to the Straits of Macassar, where this district is separated from the Australian and Papuan subregions by Wallace's line (q.v.). See ZOOGEOGRAPHY.

Malays', a race of people inhabiting the Malay Peninsula and the Malay Archipelago, and claiming to have their native country in the highlands of Sumatra. The civilization of India appears to have extended itself to the Malays at an early date. In the 13th century the Malays were on the Peninsula of Malacca, where they built a city of the same name, and founded an empire. Their sultans had subdued Sumatra previously to their settling in Malacca. They afterward possessed themselves of the rest of the Sunda Isles, of the Philippines, the Moluccas, and some of the Australian groups, where Malay tribes are found resembling, in their features, religion, and government, the Malays of Malacca. At that time they acted a splendid part in Asia; they carried on commerce, in part with their own ships, and planted colonies. Great numbers of ships from China, Cochin China, Hindustan, and Siam filled the harbors of Malacca. They are now divided into distinct tribes, without any general head. This is partly owing to the superiority which the Europeans, particularly the Dutch, have obtained in the Indian seas, and partly to the feudal system of the Malays, by which the national power has been divided and a common spirit prevented by the increasing power of the vassals. The civilized Malays profess the Mohammedan religion. Besides the Koran, the Malays have various local laws. They are fierce and warlike, always bearing arms, and much addicted to the use of force, treacherous in their alliances, and addicted to piracy. The Malay language is widely used as the language of commerce throughout the South Seas and in the islands south of the Philippines. The Malays have long pursued a piratical career, darting from hidden streams in their well-manned proas on any vessel that approached too near the coast, or more boldly lying in wait in fleets in the open sea, for any expected rich prize. Physically considered, the Malays are of low stature, slight in figure, and with very small wrists and ankles. The face is round, the eyes black and somewhat almond-shaped, the nose short and small, cheek bones prominent, features flat, the hair straight and black, the complexion yellowish. In various respects they bear a close resemblance to the Mongolians of Eastern Asia, but differ from them radically in language, all their dialects belonging to a distinct Malayo-Polynesian family which is widely distributed throughout the Indian and Pacific oceans. Of late years the lessons taught them by European and American war vessels have forced the Malays to desist from piracy, their old lawless, roving habits being largely abandoned for the more settled occupations of trade and agriculture. Among the many Malay tribes are the Sakais, or tree-dwellers, who build their houses in forked trees, eight to twelve feet above the ground, reached by bamboo ladders, which are hoisted at will. The tree-dwellers are armed with long blow-guns shooting poisoned arrows. The bamboo furnishes most of their articles of ornament and utility. The blow-gun is a bamboo about an inch and a half in diameter and six and a half feet in length. The bore, drilled most accurately, is a quarter of an inch, and the darts nine inches in length, about the circumference of a heavy darning-needle, sharpened at one end and poisoned. With these they secure all the meat they eat in the jungle,— birds, monkeys, snakes, and lizards. They also have knives made of bamboo.

The Malay intellect is of a low order, and the race has never developed a native culture, their civilization being entirely due to foreign influences, chiefly Hindu and Arab. The Malay language, which is soft and harmonious and of simple structure, is written in the Arabic character, which is ill suited for the purpose. Lately the Roman system has been largely adopted, especially in the Dutch and English dependencies. The literature, which is copious, comprises poetical compositions, such as rhyming-proverbs, love-songs, and dramas displaying some originality, but little imagination. The prose writings are mostly based on Arab or Persian models. Consult Crawfurd, 'History of the Indian Archipelago'; Logan, 'Journal of the Indian Archipelago and East Asia, and Ethnology of the Indian Archipelago'; Wallace, 'The Malay Archipelago.'

Malbaie, Canada. See MURRAY BAY.

Malbone, măl-bōn', **Edward Greene,** American painter: b. Newport, R. I., August 1777; d. Savannah, Ga., 7 May 1807. As a boy he was in the habit of frequenting the theatre at Newport to watch the painting of the scenes. At that early age he executed an entire scene, a landscape for the stage, the success of which encouraged him to devote his attention exclusively to painting. At 17 he established himself in Providence as a portrait painter. Meeting with success, he removed in 1796 to Boston, and during the next four years pursued his art in various cities. In 1800 he accompanied Washington Allston (q.v.) to Charleston, and in the succeeding year the two young artists sailed for Europe. Malbone when in London was urged by Benjamin West to take up his permanent residence there with the prospect of ample professional employment; but he returned to Charleston in December 1801. For several years he painted miniatures in the chief cities of the United States with great reputation. His principal imaginative work is 'The Hours,' in which the divisions of the day are personified by female figures.

Malbrouk, măl-brŭk', a yellowish, grizzled monkey of West Africa (*Cercopithecus cynosurus*), distinguished from other species of the genus (called guenons) by its wide flesh-colored face with a band across the forehead, the bristly whiskers and ventral parts white.

Malcolm, măl'kŏm or mâ'kŏm, the name of four Scottish kings: MALCOLM I., reigned from 943 to 954, and during this period occurred the cession of Cumbria to the Scots by Edmund I., the English sovereign. MALCOLM II. (d. Glams 1034), succeeded Kenneth II. in 1005 and in his reign Lothian and Strathclyde were secured to Scotland. MALCOLM III., surnamed Canmore (Great Head); b. about 1024; d. near Alnwick, Northumberland, 13 Nov. 1093. After the murder of his father, Duncan, by Macbeth, he was assisted by Siward of Northumbria, and Edward, the Confessor. After the death of Macbeth he was crowned at Scone in 1058. In 1068 he granted asylum to Edgar Atheling, his mother, and two sisters (one of whom, Margaret, he married in 1070), with a number of Saxon exiles. His reign, though largely concerned in warring with England, had nevertheless an important bearing on the civilization and consolidation of Scotland. MALCOLM IV. (the Maiden), d. Jedburgh 9 Dec. 1165, succeeded his grandfather, David I., in 1153. He suppressed two rebellions in his realm, and surrendered Northumberland and Cumberland to Henry II. in 1157.

Malcolm, SIR **John,** British soldier and diplomatist: b. Burnfoot, Dumfriesshire 2 May 1769; d. Windsor, England, 31 May 1833. He entered in 1782 the service of the East India Company, in 1797 was made captain, and till 1799 was engaged in various important services, terminating at the fall of Seringapatam. He was three times ambassador to Persia, and in 1822 was made major-general, and received a grant of £1,000 per year from the East India Company. He was governor of Bombay, 1827–31, when he finally returned to Britain. He was knighted in 1812. His principal works are: 'A Sketch of the Sikhs'; 'The History of Persia' (1815); 'Sketches of Persia'; 'A Memoir of Central India'; a treatise on the Administration of British India (1823); 'Life of Lord Clive' (1836). Consult Kaye, 'Life and Correspondence of Major-General Sir John Malcolm' (1856–7).

Malczewski, măl-chĕv'skē, **Antoni,** Polish poet: b. Warsaw, Poland, 3 June 1793; d. there 2 May 1826. He entered the Polish army in 1811, but resigned in 1816 and traveled on the continent, where he met Byron. He settled in Warsaw and there wrote 'Marja' (1825), an epic poem which after his death was recognized as a literary work of great merit, and has since been translated into several languages. None of his work brought him fame or recognition during his life, and he died in wretched poverty. A tomb «To the author of Marja» was erected in Varsovia.

Malden, mâl'dĕn, Mass., city, in Middlesex County; on the Malden River, and on the Boston & Maine railroad; about four miles north of Boston. It is connected by electrical railway with Boston, Lowell, Haverhill, Lynn, Salem, and a number of other cities and towns. Malden includes several villages.

The first settlement was made in 1641, but the place remained a part of Charlestown until 1649, when it was made a separate, incorporated municipality. It was chartered as a city in 1881. It is a manufacturing city, having over 630 manufacturing establishments, representing nearly 50 different industries. The chief products are rubber boots and shoes, boot and shoe lasts, and boot-trees, wire cord, leather, sand and emery paper, cotton goods, fibre goods, hosiery and hosiery supporters, knit goods, furniture, soap, and picture molding. The manufactories have a combined capital of nearly $8,000,000, and the annual output is nearly $17,000,000. The number of employees is about 5,000. The municipal expenditures are annually about $602,000; the principal items of which are for schools, $155,000; for waterworks, $45,000; for charities, $40,000; for fire department, $35,000; police, $30,000; for municipal lighting, $30,000. The Metropolitan District water system supplies water to the city, also to Melrose and Medford. Malden has excellent public and parish schools, a number of fine church buildings, a Y. M. C. A. building, four libraries, which contain about 33,000 volumes, a Home for the Aged, and a city hospital. The Converse Library building, designed by Richardson, is beautiful and commodious. The government is vested in a mayor and a council. The executive appoints, subject to the approval of the council, the administrative officials. Pop. (1890) 23,031; (1900) 33,664; (1910) 44,404.

Maldive mal'dīv) **Islands** (Thousand Isles), Indian Ocean, a chain of islands at the entrance to the Arabian Sea, 500 miles west of Ceylon, extending from lat. 0° 40′ S. to 7° 6′ N., nearly on the meridian of 73° 30′ E., with a breadth of about 50 miles. The chain is composed of 17 coral atolls (see ATOLL), the larger islands richly clothed with wood, chiefly palm, fertile in fruit, and in various kinds of edible roots. They also produce millet, and abound in cocoanuts, fowls, and all descriptions of fish. The inhabitants are a civilized race of people of mixed Singhalese and Arab extraction, Mohammedans and speaking a dialect closely allied to the Ceylonese. They carry on a considerable trade with Bengal, Ceylon, and the Malabar coast, as also to the Red Sea and to Sumatra; exchanging cowries, which are plentiful in the Maldives, coir, mats, oil, fish, tortoise-shell, etc., for rice, sugar, tobacco, and manufactured goods. They are expert navigators and sailors, and have schools for teaching navigation on some of the islands; and they make and repair nautical instruments. They are governed by a sultan, whose title and rank are hereditary; he resides in the island of Mali and pays annual tribute to the British government in Ceylon. Pop. about 30,000.

Male Fern. See Ferns and Fern-allies.

Male Preponderance. See Prepotency.

Malebranche, Nicholas, French philosopher: b. Paris 6 Aug. 1638; d. there 13 Oct. 1715. He studied philosophy in the Collège de la Marche, theology in the Sorbonne and entered the congregation of the Oratorians in 1660. In the history of French metaphysical speculation he ranks second only to Descartes, the greatest of French thinkers, and in 1699 was made member of the Academy of Sciences. He was induced to give many years' study to the Cartesian philosophy by the perusal in 1664 of the treatise 'De Homine' by Descartes, and the fruit of his investigations appeared in his brilliant and original works, 'De la Recherche de la Vérité' (1674), and 'Traité de l'Imagination.' The essence of his philosophy is a sort of mystical idealism. According to him, we have cognizance of things, as well objective realities, as subjective thoughts and feelings, through the idea which resides in our souls; but this idea is in God, so that we perceive everything in God (*vision en Dieu*) as the primal cause of all existences and things. Hence the famous doctrine of 'Occasionalism' or 'Interference,' in accordance with which the objective thing and the subjective impression are made on every occasion to coincide, by the direct interposition of God, in whom alone we think and feel. In the history of philosophy Malebranche may be styled the connecting link between Descartes and Spinoza, the difference between his philosophy and that of the pantheist Spinoza consisting in the fact that to him the Universe was in God, and to Spinoza God was, in fact, in the Universe. Among his other works are to be mentioned 'Conversations Chrétiennes' (1676); 'Traité de la Nature et de la Grace' (1680); 'Traité de la Morale' (1684); 'Entretiens sur la Metaphysique et la Religion' (1688); 'Entretiens d'un Philosophe Chrétien et d'un Philosophe Chinois sur l'Existence et la Nature de Dieu' (1708). Consult: Blampignon, 'Etude sur Malebranche' (1861); Ollé-Laprune, 'La Philosophie de Malebranche' (1870); André, 'La Vie du Révérend Père Malebranche' (1886); Farny, 'Etude sur la Morale de Malebranche' (1886).

Malesherbes, Chrétien Guillaume de Lamoignon de, krā-tĕ-ăṅ gē-yôm dė lā-moin-ŏṅ dė mäl-ĕs-ārb, French statesman: b. Paris 6 Dec. 1721; d. there 22 April 1794. He was educated at the Jesuits' College, entered the legal profession and in 1745 became counsellor of the Parliament of France; in 1750 he was president of the Court of Aids. He was broad-minded and liberal in his policy, favoring the publication of the 'Encyclopédie' and owing to his protestation against different measures of Louis XV. was removed from office. Under Louis XVI. he was minister of the interior, but resigned in 1776 and until the Revolution spent his time upon his estates and in travel, with the exception of 1787–8, when he was again minister. At the outbreak of the Revolution he came loyally to the assistance of Louis XVI. and was leading counsel in his defense. He remained with the monarch until almost the last and 11 months later was guillotined for treason. He was the author of essays and pamphlets on financial questions, etc.

Malet, Claude François de, klōd frāṅ-swā dė mä-lā, French conspirator: b. Dôle, Franche-Comté, France, 28 June 1754; d. Paris 29 Oct. 1812. He entered the army in 1771 and became a brigadier-general in 1799. Suspected of conspiracy against Napoleon, he was dismissed from the army in 1807 and confined in La Force. While there he laid new plots and was thenceforward confined in a state prison from 1808 till 1812. During Napoleon's campaign in Russia Malet made his escape from prison on the night of 22–3 October, and by circulating the false news of Napoleon's death won over some of the National Guards. While the latter secured the principal public offices in his name, Malet liberated his fellow conspirators, Generals Guidal and Lahorie, from prison. He was, however, himself taken prisoner by Laborde, chief of the military police of Paris, and was shot with his fellow conspirators.

Malet, Lucas. See Harrison, Mary Saint Leger.

Malherbe, François de, frāṅ-swä dė mäl-ārb, French poet: b. Caen, France, 1555; d. Paris 16 Oct. 1628. He was educated in Heidelberg and was engaged in the wars of the League. In 1605 he became court poet under Henry IV., but his work as a critic was of greater value than his poetry, which was lacking in poetic feeling and originality, though metrically perfect. He was the founder of the French school of classicism and must be credited with arousing a critical sense among the thinkers of France. His works consist of translations from the Latin and one volume of original verse. Consult: Allais, 'Malherbe et la Poésie française à la fin du XVI. Siècle' (1892); Brunot, 'La Doctrine de Malherbe' (1891).

Malibran, Maria Felicita, mezzo-soprano singer: b. Paris 1808; d. Manchester, England, 1836. She was early trained for the operatic stage by her father Manuel Garcia (q.v.), the Spanish tenor, and made her debut in London (1825). She had lived in that city since 1817 as a teacher of singing, and her success in Rossini's 'Barber of Seville' was such that she was induced to follow her father to New York, where he had an engagement to establish grand opera. Here she married a French merchant named Malibran. She returned to the stage on her husband's failure in business, and in the spring of 1828 appeared on the Parisian boards in Rossini's 'Semiramis.' She subsequently was welcomed with great enthusiasm in London, Naples, Vienna, Milan, and Venice, and traveled with the violinist de Bériot, whom she married shortly before her early death. She was a great actress as well as a marvellous songstress, and the irresistible charm of her person, added to the generosity of her mind and disposition, made her during her brief career one of the most fascinating operatic singers that had ever won the applause of the European public. In 1838 a statue was erected to her in Brussels, which had been her last place of residence. Consult: Nathan, ‘Life of Madame Maria Malibran de Bériot’ (1846).

Malic Acid, an organic acid discovered in 1785 by Scheele, and now known to be widely diffused throughout the vegetable kingdom, occurring sometimes in the free state, and sometimes in the form of its potassium, magnesium, or calcium salts. It occurs abundantly, for example, in the gooseberry, cherry, strawberry, and barberry, and also in unripe apples, from which latter fact it derives its name (Latin *malum*, an apple). It may be conveniently prepared by boiling the juice of mountain ashberries with enough milk of lime to almost neutralize it, and pouring the precipitate into boiling dilute nitric acid. Acid malate of calcium crystallizes from the nitric acid upon cooling, and this is dissolved in water, and precipitated by acetate of lead, the lead malate that is thrown down being subsequently decomposed by sulphuretted hydrogen gas. Malic acid has the formula $C_4H_6O_5$, or $C_2H_3(OH).(COOH)_2$, is dibasic, and can be obtained in the form of colorless prisms or needles, which are hygroscopic, and dissolve readily in water and in alcohol. Malic acid kills algæ, and when present in a solution in any considerable amount it prevents the precipitation of cupric and ferric salts by the alkalies. With bases it forms compounds known as “malates,” which are mostly soluble.

Malice, in law, a premeditated or formed design to do mischief or injury to another, called also “malice prepense” or “aforethought.” Blackstone says that malice prepense is not so properly spite or malevolence to the deceased in particular, as any evil design in general; the dictate of a wicked, depraved, and malignant heart; and it may be either express or implied in law. Express malice is when one, with a sedate deliberate mind and formed design, doth kill another. In many cases where no malice is expressed, the law will imply it; as where a man wilfully poisons another; in such a deliberate act the law presumes malice, though no particular enmity can be proved.

Malicious Mischief, in law any injury done to the person or property of another with deliberate malice. This is an indictable offense both in Great Britain and the United States. The comprehensive English Black Act (so-called from its preamble that “several ill-designing and disorderly persons have of late associated themselves under the name of blacks”) with others of a like kind were in 1861 codified (24 and 25 Vic., ch. 97) into an act which extends malicious mischief to buildings, fish ponds and other real estate, as well as to most classes of personal property. To constitute this offense, real not merely legal malice must be proved, such as is defined by Blackstone, “a spirit of wanton cruelty or black and diabolical revenge”; or, as defined by the supreme court of Massachusetts, “a spirit of cruelty, hostility or revenge.” This spirit must be cherished by the offender not against a third party, but against the party whose person or property has been injured. Some States of the Union make secrecy a necessary element in the offense, others generalize the offense as implying merely the infliction of unlawful injury. If the injury was inflicted in the discharge of official duty, or under an honest sense of justification, this is sufficient defense to secure acquittal. The offense may be either a misdemeanor (q.v.) or a felony (q.v.) according to its circumstances. Consult: McClain, ‘Treatise on Criminal Law, as Now Administered in the United States’ (1897); and Harris, ‘Principles of the Criminal Law.’

Malicious Prosecution, prosecution of a person unsuccessfully, maliciously and without cause. To constitute this offense it must be proved (1) That the prosecution averred to be malicious was instituted by the defendant named. (2) That it was decided against prosecutor. (3) That the suit was without probable cause. (4) That the motive was malice. (5) That the plaintiff was injured by such malicious prosecution.

Quod facit per alium facit per se is fully applicable to the defendant in a suit for malicious prosecution; hence a corporation may be liable though they acted through their agent. (See TORT.) Consult: Newell, ‘Malicious Prosecution, False Imprisonment, and Abuse of Process’ (1892).

Maligi, mä-lē-hē', **Philippines, an island** lying southeast of Talim Island in the Bay Lagoon (q.v.); it is the seat of the United States military prisons.

Malig'nant Pustule. See ANTHRAX.

Malig'nants, in English history, a name applied in 1643 by members of Parliament to designate those whom they considered to be the evil advisers of Charles I. Afterward the name was extended to all who sided with the king against the Parliament.

Malinao, mä-lē'now, Philippines, (1) a pueblo of the province of Albay, Luzon, situated on the Lagonoy Gulf, 18 miles north by west of Albay, the provincial capital, and three miles north of Tabaco. It is on the main road, and is the shipping point for the large hemp product of the surrounding region. Pop. 11,800. (2) A pueblo and military station of the province of Capiz, Panay, on the Akdón River, 6 miles from its mouth, 30 miles west of Capiz. Pop. 5,800.

Malines, mä-lēn. See MECHLIN.

Malingering, mä-lĭng'gār-ĭng, a term denoting feigning disease on the part of a soldier, sailor, prisoner, etc., in order to obtain discharge from service, or escape from duty or labor. It implies some overt act, such as the previous application of a ligature, or the taking of some drug, which produced the appearance of the disease said to exist. A worse form of the same crime, “wilfully maiming,” is erroneously called malingering.

Mall, mâl or mĕl, **The**, (1) a promenade in Central Park, New York, regarded as one of the most successful landscape effects in this country. (2) An avenue in London, on the north of Saint James Park.

Mallalieu, măl-la-lū', **Willard Francis**, American Methodist bishop: b. Sutton, Mass., 11 Dec. 1828. He was graduated from Wesleyan University in 1857 and became a Methodist Episcopal clergyman in 1858. He has held many important charges and in 1872, 1876, 1880, and 1884 was a member of the general conferences. He was presiding elder of the district of Boston in 1882–4 and in 1884 was elected bishop.

Mal'lard. See DUCK.

Mallarmé, Stéphane, stā-fän māl-är-mā, French poet: b. Paris March 1842; d. there 9 Sept. 1898. Most of his life was passed as an instructor in English at the Lycée Fontanes of Paris. He is known as the founder of the curious poetic school of the «Décadents,» in whose organ, 'Le Décadent,' as well as in 'Le Parnasse Contemporain,' he published much. Incomprehensibility appears to have been the object of his study, and he entirely attained it in his preface to an edition (1880) of Beckford's 'Vathek.' Others of his works are 'L'Après-Midi d'un Faune' (1876); 'Petite Mythologie' (1878); 'Les Dieux antiques' (1880); 'Poésies' (1887), a translation of Poe's poems (1888), perhaps his most satisfactory performance; and 'Vers et Prose' (1893).

Mal'leabil'ity, in metallurgy, the property of extending under the blow of a hammer. For every metal there is a temperature of greatest malleability. The following is the order of malleability of the metals: Gold, silver, copper, platinum, iron, aluminum, tin, zinc, lead.

Mal'leable Glass. See GLASS, MALLEABLE.

Malleco, māl-yā'kō, Chile, a province bounded by Argentina, Cautin, Bio-bio, and Arauco. It has an area of 2,857 square miles. The capital city is Angol. The province is mountainous and well wooded in the eastern and western parts. About one half of the population is composed of Indians of the Arauco tribe. Wheat is the staple agricultural product of the country. A portion of the province is traversed by two railway lines running north and south. The population has increased from 59,490 in 1895 to more than 110,000.

Mal'lee-bird, or **Maleo,** a name for the Australian mound-bird (q.v.), derived from a native language.

Mal'lery, Garrick, American ethnologist: b. Wilkesbarre, Pa., 23 April 1831; d. Washington, D. C., 24 Oct. 1894. He was graduated from Yale College in 1850 and was admitted to the bar in 1853; he practised law in Philadelphia until 1861, when he enlisted and served through the war in the Federal army, attaining the rank of lieutenant-colonel. He was executive officer of the Signal Service Bureau until 1876, when he was engaged in a geological survey in Dakota, and in 1879 was retired from the army and appointed chief of the bureau of ethnology. Among his books are: 'A Calendar of the Dakota Nation' (1877); 'Israelite and Indian, a Parallel in Planes of Culture' (1889); 'Greeting by Gesture' (1891); 'Picture Writing of the American Indians' (1893); etc.

Mal'leson, George Bruce, English historical writer: b. London 8 May 1825; d. there 28 Feb. 1898. He was educated at Winchester College, and from 1842 till 1877 served in India, at first in the army, and subsequently in government posts. His chief work, his 'History of the Indian Mutiny' (1878–80), which commenced where the 2d volume of Kaye's 'Sepoy War' left off, and in 1890 there appeared a joint edition of the two histories in six volumes, the 3d volume of Kaye's work being omitted and a new 6th one added. Other works by him are: 'The Mutiny of the Bengal Army' (1857); 'History of the French in India' (1868); 'Studies from Genoese History' (1875); 'Historical Sketch of the Native States of India' (1875); 'Final French Struggles in India and Indian Seas' (1878); 'History of Afghanistan' (1879); 'The Decisive Battles of India' (1883); 'The Battlefields of Germany' (1884); 'Ambushes and Surprises' (1885); 'The Indian Mutiny of 1857' (1890); and 'Refounding of the German Empire' (1892); lives of 'Clive' (1882), 'Marshal Loudon' (1884), 'Eugene of Savoy' (1888), 'Prince Metternich' (1888), 'Wellesley' (1888), 'Dupleix' (1890), 'Akbar' (1890), 'Warren Hastings' (1894), and 'Lakes and Rivers of Austria, Bavaria, and Hungary' (1897).

Mal'let, John William, American chemist: b. Dublin, Ireland, 10 Oct. 1832. He was educated at Trinity College, Dublin, and at Göttingen, and emigrating to the United States in 1853 became assistant professor in chemistry at Amherst 1854–6 and later chemist to the United States geological survey of Alabama. In 1856–60 he was professor of chemistry at the University of Alabama. He entered the service of the Confederacy and was paroled in 1865 as lieutenant-colonel of artillery. The chair of sciences at the University of Louisiana was occupied by him in 1865–8 and since 1868 he has been professor of chemistry in the University of Virginia. He has contributed valuable scientific articles to the leading chemical periodicals.

Mallet, a wooden hammer used in carpentry and also in the game of croquet (q.v.). The gavel (q.v.) is a variety of mallet. Various small mallets are used by gold beaters, jewelers, dentists and other artisans.

Mallian, mä-yän', **Julien de,** West Indian dramatist: b. Le Moule, Guadeloupe, 1805; d. Paris, France, 1851. He gained wide reputation as a writer of comedies and dramas, many of which have been presented on the metropolitan stage. The most popular are: 'Two Roses' (1831), a historical drama of the civil wars in England; 'The Carpenter' (1831), a comedy; and 'The Wandering Jew' (1834).

Mallock, William Hurrell, English author: b. Devonshire 1849. He was graduated from Balliol College, Oxford, and won the Newdegate prize in 1872. He has never entered a profession but has devoted himself entirely to literary work. His philosophical and sociological writings include: 'Is Life Worth Living?' (1879); 'Social Equality, a Study in a Missing Science' (1882); 'Atheism and the Value of Life' (1884); 'Property and Progress' (1884); 'Labour and the Popular Welfare' (1893); 'Studies of Contemporary Superstition' (1895); 'Classes and Masses' (1896); 'Aristocracy and Evolution' (1898); 'Doctrine and Doctrinal Disruption (1900); 'Religion as a Credible Doctrine' (1902). He has also written several works of fiction, most of which deal with the same social and religious problems as the above works, including 'The New Republic' (1877), in which he introduces many well-known contemporaries under thin disguises; 'A Romance of the Nineteenth Century' (1881; new edition 1894); 'The Old Order Changes' (1886); 'A Human Document' (1892); 'The Heart of Life' (1895); and 'The Individualist' (1899):

and has published two volumes of verse and a translation of Lucretius' 'On Life and Death' (1878). His philosophical works deal with the fundamentals of religion arguing for supernaturalism and aiming to show that science alone supplies no basis for religious belief; in his political and economic writings he has attacked the radical and socialistic theories and tendencies of the age.

Malloph'aga, a name used for an extensive and varied assembly of feather-eating and hair-eating bugs, usually called lice. They are very small, oval, delicate, and of swift motion; of light brown color, some with shovel-shaped heads, others with horn-like appendages on the head. One delicate kind vexes the canary, gluing eggs to its feathers and in the cracks of its perch. *Goniocotes* is a large form, a tenth of an inch long, with bristled head and shield-like head, and is one of the pests of domestic fowls. One species, colored with bands of yellow and brown, infests the turkey and the peacock. Another great family, *Liotheidæ*, contains species which resemble white ants, and prey upon the feathers of falcons and of wading birds. *Gyropus* infests guinea-pigs, massing thickly about their neck and ears.

Mal'lory, Stephen Russell, American lawyer: b. Trinidad, W. I., 1813; d. Pensacola, Fla., 9 Nov. 1873. His parents removed with him to the United States in 1820, and he was educated in Mobile and in Nazareth, Pa. He studied law and was admitted to the bar in 1839; he was United States Senator 1851–7 and in 1861 entered the service of the Confederate States as secretary of a navy not in existence. He was arrested at the close of the war and held for 10 months, after which he returned to Pensacola and was until his death engaged in law practice.

Mal'low, a genus of herbs (*Malva*), of the order *Malvaceæ*. The species, of which there are less than a score, are widely scattered, and are characterized by angled, lobed or dissected leaves, and solitary, or clustered axillary flowers. They include four species cultivated in America and one very well known weed, *M. rotundifolia*, popularly known among children as "cheese-plant" because of the shape of the fruits, which also suggested another popular name, "shirt-button plant." The plant is a perennial, very persistent of life, and rather difficult to eradicate except by constant clean cultivation. Musk-mallow (*M. moschata*), is cultivated for its large, showy pink or white flowers; *M. alcea* is also popular. *M. crispa* furnishes a useful fibre, as probably other species could be made to do. Its leaves are often used for garnishing but are not eaten. This species and *M. sylvestris* are frequently seen in old gardens and in their vicinity as escaped plants, but are not offered for sale by seedsmen. The name mallow is loosely applied to many species of the mallow family, but not of the genus *Malva;* for instance, marsh-mallow (*Althæa officinalis*), rose-mallow (*Hibiscus moscheutos*), and Indian mallow (*Abutilon avicennæ*); also, more loosely still to unrelated plants, as Jew's mallow (*Corchorus olitorius* or *C. capsularis*). See ABUTILON; CORHORUS; HOLLYHOCK; HIBISCUS.

Malmaison, măl-mä-zōñ, a celebrated French château on the Seine, 10 miles west of Paris. It was the favorite residence of Josephine, wife of Napoleon I., and here she died. The château belonged to Richelieu, and was restored in 1861 by Napoleon III. In 1870 a sortie by Ducrot from Paris was repulsed here by the Germans.

Malmesbury, mămz'bĕr-ĭ, **James Harris**, 1ST EARL OF, English diplomatist: b. Salisbury, England, 21 April 1746; d. London 20 Nov. 1820. He was educated at Merton College, Oxford, afterward studied at Leyden, and in 1768 became secretary of legation at Madrid. He was ambassador at Berlin 1772, in 1777 at St. Petersburg, and in 1784 at The Hague. In 1788 he was created Baron, in 1800 Earl of Malmesbury and viscount Fitz-Harris. In 1793, with other Whigs, he deserted Fox for Pitt, and in 1795 had married by proxy and conducted to England the Princess Caroline. Consult: 'Daines and Correspondence' (1845); 'Lord Malmesbury and his Friends' (1870). (Both works edited by J. H. Harris, his grandson.)

Malmesbury, William of. See WILLIAM OF MALMESBURY.

Malmignatte, măl-mĭ-nyăt', a spider. See LATRODECTUS.

Malmö, măl'mė, Sweden, a seaport and the third largest town of the country, on the Sound, almost opposite Copenhagen, 17 miles distant, with which it has steam-ferry communication, a channel being maintained in winter by an ice-breaker. Malmö is a busy industrial centre with important manufactures, is the terminus of several railroads, and is 384 miles by rail southwest of Stockholm. The town and its harbor have been considerably improved and modernized, and an extensive export and import trade is carried on. Malmö dates from the 12th century.

Malmsey, măm'zĭ or mălm'sĭ, a sweet wine, made from a grape grown on rocky ground, in Madeira, exposed to the full influence of the sun, and not gathered until partially withered.

Malolos, mä-lō'lōs, Philippines, a pueblo and the capital of the province of Bulacán, Luzon, situated at the head of one of the inlets of the Pampanga River delta, five miles northwest of Bulacan, the former capital. It is a telegraph and military station, is near a station of the Manila Dagupan railroad, and is the centre of an important trade. It is in a region which was a stronghold of the insurgents, and immediately after the close of the Spanish war was made the capital of the insurgent government. Pop. 14,600.

Malone, ma-lōn', **Edmund**, English Shakespearian scholar: b. Dublin 4 Oct. 1741; d. London 25 April 1812. He was educated at Trinity College, Dublin, and was called to the Irish bar in 1767, but henceforth devoted himself entirely to literary pursuits. His most important and permanent critical works are: 'Attempt to Ascertain the Order in Which the Plays of Shakespeare Were Written' (1778), which still carries authority; his edition of the poet in 10 volumes; and the edition known as the Third Variorum, which was prepared after his death by James Boswell, the younger, out of material left by the critic, and published in 21 volumes. This last is still the best of all complete critical editions. He also published: 'Remarks on the Rowley (Chatterton) Controversy'; ‘An Inquiry into the Ireland Shakespearian Forgeries’; and biographical memoirs of Sir Joshua Reynolds, Dryden, W. Gerard Hamilton, etc.

Malone, Walter, American verse writer: b. De Soto County, Miss., 10 Feb. 1866. He was graduated at the University of Mississippi, and subsequently engaged in the practice of law and in literary work. He has contributed to the periodicals of the day and has published: ‘Claribel, and Other Poems’ (1882); ‘The Coming of the King,’ short stories (1897); ‘Songs of the North and South’ (1900); etc.

Malone, N. Y., village, county-seat of Franklin County; on the Salmon River, and on the New York C. & H. R. and the Rutland R.R.'s; about 275 miles north by west of Albany, and 12 miles from the boundary between the United States and Canada. It is situated at the northern foot-hills of the Adirondack Mountains, in an agricultural region, the chief products of which are hops, hay, and potatoes. The dairy products and poultry are important.

The place was named in honor of Edmund Malone (q.v.), an Irish barrister and writer, by his friend, William Constable, who, together with his wife, named many of the places located within the limits of the large tract of land in the northern part of New York known as «The Macomb Purchase.» The first settlement was made in 1802, and its first inhabitants were mostly from Vermont and Ireland. In 1829–30 the people began considering the founding of an academy, and a number of the farmers pledged their farms as security for the payment of the debt incurred for the erection of the building, and Franklin Academy was established in 1831. The Northern railroad, now Rutland railroad, entered the town in 1851, and the New York Central in 1892.

Malone figured prominently in the War of 1812; and furnished a large number of soldiers, privates and officers, in the Civil War. The village was the scene of two Fenian (q.v.) gatherings.

The chief manufactures are paper, pulp, flour, lumber, leather, woolen goods, foundry and machine-shop products, sash doors, and blinds, men's clothing, cigars, and dairy products. The electric-light and gas plants and the waterworks are owned by private companies. Malone is the commercial centre for the greater part of Franklin and parts of the adjacent counties, a section having a population of about 50,000. There are two national banks capitalized for $300,000. The village has six fine churches, a high school building (formerly Franklin Academy), several grammar and primary schools, the county court-house, jail, a State Armory, and several wholesale establishments. The educational institutions, besides the public schools, are a State School for Deaf Mutes, and Saint Joseph's Academy. There are three public libraries, the Wead Library, 7,000 volumes, free to the people of the school district, is housed in a beautiful building donated by Mrs. S. C. Wead; the Wadhams Library, 2,000 volumes, established and maintained by a literary society, free to all the people of the town of Malone (several school districts), and the Franklin County Historical Society library, established in 1902. There is a well-kept park, the «Village green,» formerly the place of drill for the State militia. Malone was the home of William A. Wheeler, vice-president of the United States; John Larkin Thorndike, who built the Oroya and other railroads in Peru, S. A.; Ashbel P. Fitch, later of New York city, and a number of other noted people.

The government is vested in the president and board of trustees of the village under the general laws of the State of New York. The officers besides the president and six trustees are collector, treasurer, and police justice, all chosen by popular election, and the clerk and policemen who are appointed by the board of trustees. Since the Federal census of 1900 an adjoining manufacturing suburb has been incorporated in the village. Pop. (1890) 4,986; (1900) 5,935; (1910) 6,467.

Maloo Climber. See BAUHINIA.

Mal'ory, SIR Thomas, author of the English prose romance ‘Morte d'Arthur.’ The work was finished in the ninth year of Edward IV.'s reign, 1470, and published by Caxton in black-letter folio, in 1485. Little is known of the author; he may have been a priest; Caxton calls him «a servant of Jesus both day and night,» and priests frequently were accorded the title «Sir.» Probably he was a Welshman. See ARTHURIAN LEGENDS; MORTE D'ARTHUR; GRAIL, THE HOLY; LANCELOT; MERLIN; TRISTRAM.

Malot, mă-lŏ, **Hector,** French novelist: b. La Bouille, near Rouen, France, 20 May 1830; d. 18 July 1907. He studied law, but abandoned it for a literary career, and in 1859 issued the first of a long series of successful novels. He was for a time newspaper correspondent in London, and literary critic of ‘L'Opinion nationale.’ He wrote ‘Victimes d'Amour’ (1859); ‘Sans famille,’ published in English as ‘No Relations’ (1878); ‘Conscience’ (1888); ‘Complices’ (1893); an autobiography, ‘Le Roman de mes Romans’ (1896).

Malpighi, măl-pē'gē, **Marcello,** Italian anatomist: b. Crevalcuore, Italy, 10 March 1628; d. Rome 29 Nov. 1694. He received a medical education in Bologna and was granted a doctor's degree in 1653. In 1656 he became professor of medicine at Pisa, where he formed a friendship with the mathematician Borelli, who encouraged him to proceed with researches in anatomy. His health failing he returned to Bologna and continued his investigations, which resulted in discoveries which established facts undisputed in the modern world of science and placed the world's knowledge of physiology on a new footing; his researches in botany and entomology were highly important. In 1691 he was summoned to Rome as first physician to Innocent XII., in which office he died. He published numerous scientific works of great value, a complete edition of which was published in Venice 1743.

Malplaquet, măl-plă-kā, **Battle of,** the bloodiest in the war of the Spanish Succession, gained by Marlborough and Eugène, the commanders of the allies, against the French under Villars 11 Sept. 1709. The French lost 10,000; the allies more than 20,000.

Mälstrom. See MAELSTROM.

Malt and Malting. See BREWING AND MALTING.

Malt Refuse, Malt Sprouts. See NUTRITION OF FARM ANIMALS.

Malta, mâl'ta, an island in the Mediterranean, belonging to Great Britain, with its dependencies, Gozo, Comino, and Cominetto, forming the elevated portions of the plateau that extends northwestward to Sicily, 62 miles, and southward to Africa, 197 miles, and divides the Mediterranean into two basins. The Maltese group has a total area of 117 square miles, of which 95 square miles belong to Malta. Malta is of irregular oval shape, 17 miles long, with a central breadth of 9 miles; its greatest elevation is over 750 feet. It is of limestone formation, and is deeply indented on all sides except the south, where the coast forms a continuous and almost unbroken line. Of great strategical importance, it is very strongly fortified, especially Valetta, the capital, which is the headquarters of the British Mediterranean fleet, and the principal naval and mercantile coaling station in the Mediterranean, importing and exporting annually between 500,000 and 600,000 tons. Malta is also a valuable sanatorium for troops employed in the Orient. The climate is hot in summer and enervating when under the influence of the humid sirocco blowing from Africa, but generally is mild and healthful. There are only a few small streams, but the springs are so numerous and copious that no deficiency of water is felt, and since 1880 an extensive system of waterworks has greatly enhanced sanitary conditions. Malta has a bare, stony appearance, owing to the absence of trees. The soil is thin, but remarkably fertile; and its fertility is increased by the skilful cultivation and the diligent toil of the inhabitants. Large crops of wheat and potatoes are raised, early varieties of the latter being largely exported to England; maize, barley, cotton, clover, oranges, figs, grapes, carob beans, and peaches and other fruits are also grown. Filigree ornaments and a little cotton are manufactured. Sheep and goats are kept, with smaller numbers of cattle, mules, asses, and horses. The language of the people is a corrupt dialect of Arabic, with a strong admixture of Italian and other words; some authorities, however, connect it with the ancient Phœnician. The native population believe themselves to be of Phœnician descent. From the time of the settlement of the Knights of St. John down to quite recently Italian was the official language; but it has been superseded by English. Most of the educated Maltese speak Italian, and some speak English; the peasantry as a rule know neither the one nor the other. The Maltese are a sober, industrious race of people, though often quick-tempered and ignorant. They are proud of their island home — they love to call it "the flower of the world" — and are devout Roman Catholics. Legislation is carried on by 6 official and 14 elected members, the British governor, with the power of veto, being president. There is also an executive council, consisting of the governor as president, seven official members, and three nominated by the governor from among the elected members of the legislative chamber; the crown retains the right to legislate also through orders in council. There is no direct taxation in Malta. The local militia, including the Royal Malta Fencible Artillery, number about 1,200. The population in 1910 was 196,000, including 2,300 British residents, 1,200 foreigners, and from 6,000 to 7,000 imperial troops. Malta has great historical, archæological, and architectural interest. It passed successively through the hands of Phœnicians, Greeks, and Carthaginians, and was finally attached to Rome during the Second Punic War. Relics of these various occupations exist throughout the island. After the fall of the Roman empire it was seized at different times by Vandals, Goths, and Saracens. From the last it passed to Sicily, and followed its fortunes till 1522, when Charles V. granted it to the order of St. John of Jerusalem, the Knights of St. John of Malta being distinguished during successive centuries for their bold defense of Christianity against Moslem assaults. In 1798 the grand-master surrendered Valetta without defense to Napoleon. Shortly afterward the inhabitants regained it and asked for a British protectorate, which was confirmed in 1814 by the Congress of Vienna. Consult: Ballou, 'The Story of Malta' (1893).

Malta Fever (also MEDITERRANEAN FEVER, NEAPOLITAN FEVER, ROCK FEVER, etc.), a disease occurring near the Mediterranean shores, in which the fever symptoms are accompanied by intense pain, enlargement of the spleen, swelling of the joints, excessive perspiration, and other conditions tending to bring about extreme weakness and loss of functional activity. Its cause is now assigned to *Micrococcus melitensis*. Treatment thus far is not specifically determined. Hygienic care, such as is normal in fevers, with special attention to diet and bathing, together with ordinary applications for reducing swellings, is all that can be recommended.

Malta, Knights of. See KNIGHTS OF MALTA.

Maltbie, mâlt'bĭ, **Milo Roy,** American sociologist: b. Hinckley, Ill., 3 April 1871. He was graduated from Upper Iowa University in 1892 and took the degree of Ph.D. at Columbia in 1897. He was professor of economics and mathematics at Mount Morris College, Ill., in 1893–5, and from 1897–1902 was secretary of the Reform Club Committee on City Affairs, and has devoted himself to the study of municipal questions, going abroad in 1899 to investigate foreign cities and their problems. He was lecturer on municipal government at Columbia University in 1900, and has been editor of 'Municipal Affairs' since 1897. He has written: 'English Local Government of To-Day' (1897); 'Municipal Functions' (1898); and 'Street Railways of Chicago' (1901).

Malte-Brun, măl'tĕ-broon (Fr. mălt-brŭñ), **Conrad** (properly MALTHE BRUNN), Danish geographer: b. Thisted, Jutland, 12 Aug. 1775; d. Paris 14 Dec. 1826. He devoted himself to literature and politics in Copenhagen, but having given offense by writing in favor of the liberty of the press and the enfranchisement of the peasants, was banished to Sweden in 1796. He went later to Paris, where he became famous as a geographer. He edited the foreign political department of the 'Journal des Debats,' but is best known for his 'Summary of Universal Geography' (8 vols., 1810–29). The first six volumes only were completed by Malte-Brun. Among his other works are: 'Ancient and Modern Poland'; 'History of Travel'; and 'Mathematical, Physical and Political Geography.'

Maltese (mâl-tēs' or -tēz') **Cross.** See Cross.

Maltese Dog. See Dog.

Mal'tha, (1) according to Pliny, a name used for an inflammable mud which flowed from a pool at Samosata, Commagene, North Syria, and resembled naphtha. (2) A mixture of wax and pitch for caulking ships; mineral tar is another name for maltha, which is found oozing from rocks in certain localities, particularly in California.

Mal'thus, Thomas Robert, English political economist: b. near Dorking, Surrey, 14 Feb. 1766; d. Bath 29 Dec. 1834. He studied theology at Cambridge and was ordained in the Church of England, continuing to pursue his profession as a teacher while holding a small living in Surrey. In 1805 he was appointed professor of history and political economy at Haileybury College. In his famous 'Essay on the Principles of Population' he propounded (1798) what is known as the Malthusian Doctrine, namely that the increase of population advances at a geometrical, the increase of the means of life at an arithmetical ratio: that this condition of things renders the condition of the poor more and more hopeless, that unless famine or war interfere to diminish population the means of life will eventually prove inadequate; that discouragement of early and improvident marriages and the cultivation of self-restraint must be employed to avert the danger. These positions have been the subject of long and widespread discussion. His other writings include: 'Principles of Political Economy' (1826); 'Definitions in Political Economy' (1853). Consult: Bonar, 'Malthus and His Work' (1885); Soetbeer, 'Die Stellung der Sozialisten zur malthusischen Bevölkerungslehre' (1886); Molinari, 'Malthus, Essai sur le Principe de Population' (1889); Cossa, 'Il principio di populazion di T. R. Malthus' (1895).

Malus, Etienne Louis, ā-tē-ĕn loo-ē mä-lüs, French physicist and military engineer: b. Paris 23 June 1775; d. there 23 Feb. 1812. He was educated at the Ecole Polytechnique, and upon leaving the school received a captain's commission in the corps of engineers, and served during the campaign of 1797 with the army of the Sambre and Meuse. Subsequently he participated in the campaign in Egypt, and in 1804 superintended the construction of fortifications at Antwerp and Strasburg. Whatever time could be spared from his professional labors was devoted to scientific pursuits. His chief publications consist of a mathematical 'Traité d'Optique,' first published in the 'Mémoires présentés à l'Institut' in 1810, in which he promulgated some valuable discoveries respecting the refraction of light in transparent media; and the 'Theory of Double Refraction' (Mémoires présentés a l'Institut, Vol. II.), containing an account of his discoveries respecting the polarization of light, which consisted in showing that light may acquire properties identical with either of two rays yielded by refraction through Iceland spar by the process of simple reflection at a particular angle from any transparent body. This discovery gained for its author his election to the Institute and the biennial medal of the Royal Society of London. He also published an 'Essay on the Measurement of the Refractive Force of Opaque Bodies.'

Malvaceæ, a family of flowering plants, the mallows and their allies, in the order *Columniferæ*, with the calyx gamosepalous; petals contorted in the bud, stamens numerous, monadelphous; anthers extrorse, monothecious; pollen-grains spiny. They are herbaceous or woody plants, mucilaginous in their juices, and usually densely hairy, especially when young. The leaves are palmately nerved and frequently deeply five-lobed. The flowers are large, funnel-shaped, conspicuously and beautifully colored, attracting the aid of insects in fertilization. The fruit is schizocarpous. This family contains many important genera and species of plants elsewhere described, such as the mallows (*Malva, Lavatera*, etc.), hollyhocks (*Althæa*), cotton-plants (*Gossypium*), the rose-mallows (*Hibiscus*), etc. About 60 genera and 700 species are accredited to this family by systematic botanists.

Malvern, măl'vėrn, Ark., town, county-seat of Hot Springs County; on the St. Louis, I. M. & S. railroad; about 20 miles southeast of Hot Springs. It is in an agricultural region, in which the principal products are cotton and fruit. The chief manufactures are flour, lumber, and bricks. The trade is principally in lumber, cotton, and fruits. Pop. (1910) 2,778.

Malvern, mâl'vėrn, **Great,** England, a fashionable inland watering-place in Worcestershire, on the east side of the Malvern Hills, at the foot of the Worcestershire Beacon, 1,395 feet high, the summit of which commands magnificent views. A restored 11th century priory church and Malvern College are the chief edifices. Malvern is widely celebrated and greatly frequented owing to its fine climate and the efficacy of its mineral springs. Pop. about 16,400.

Malvern Hill, Battle of. After the close of the battle of Glendale (q.v.), 30 June 1862, the Army of the Potomac was put in position on Malvern Hill, an elevated open plateau on the left bank of James River, 60 feet high, and about 1½ miles by ½ mile in area. On this plateau the army was disposed in a large arc, both flanks resting on the river, and protected by gunboats. Porter's Fifth corps was on the left, Couch's division of Keyes' corps on the right of Porter, Heintzelman's two divisions—Kearny and Hooker—on the right of Couch, Sumner's corps on the right of Heintzelman, and Franklin's corps on the right of Sumner. Peck's division of Keyes' corps was on the right of Franklin and was the extreme right of the army, and it and the left of Porter's line stood back to back. There were numerous batteries of artillery along and in rear of the line. The position was a very strong one: the Confederate D. H. Hill says: «Tier after tier of batteries were grimly visible on the plateau rising in the form of an amphitheatre.» The approach to the position was over 400 to 500 yards of open ground swept by artillery fire. When it was discovered early in the morning of 1 July that McClellan had fallen back from Glendale during the night, Lee gave orders for immediate pursuit. Jackson marched by the Willis road, and when in sight of Malvern Hill he formed line, with Whiting's division on his left and D. H. Hill's on his right, one of Ewell's brigades occupying the interval. The rest of Ewell's division and Jackson's own division were held in reserve. Magruder was directed to take position on Jackson's right, but before his arrival two of Huger's brigades came up and were placed next to Hill. The Confederates felt the Union lines with infantry and artillery, and when Magruder came up, about 2 P.M., Huger's two brigades — Armistead and Wright — with four batteries, were ordered forward. The batteries, as they emerged in succession from the woods, were promptly knocked to pieces by the fire of over 60 guns brought to bear upon them, and the two brigades were repulsed with loss. This attack fell upon the right of Porter and left of Couch, and the latter was now reinforced by Caldwell's brigade of Sumner's corps. No serious advance had been made on other parts of the line, but Hill had suffered severely from artillery fire in getting his troops in position opposite Couch's right. At 5:30 P.M. Magruder assaulted Porter's line and the left of Couch with the five brigades of Armistead, Cobb, Wright, Mahone, and Barksdale. All were met by such a terrific fire of artillery and musketry, which swept the slope of the hill, that they could make no headway, though gaining temporary advantages, and fell back with great loss. Toombs', G. T. Anderson's, and Ransom's brigades were now ordered in; Toombs got lost in the thick woods; Anderson and Ransom shared the fate of those preceding them, and fell back. Magruder's fight ended before dark. While Magruder was thus engaged with Porter and the left of Couch, D. H. Hill, on his left, advanced against Couch's right, which, as the action progressed, was reinforced by Caldwell's brigade, three regiments of Hooker's division, under Sickles, and some of Kearny's division. Hill's five brigades were commanded by Gens. Garland and Ripley, and Cols. J. B. Gordon, A. H. Colquitt, and C. C. Tew. The slope to Couch's line was about 800 yards, without cover, and the advance directly in the face of guns on the slope and bristling on the summit, from which burst forth such a terrific fire of shell and canister that Hill's brigades withered under it. Toombs' brigade was picked up and sent to their support, but the six brigades were hurled back, some in great disorder after the loss of half their men. Later in the evening Taylor's brigade of Ewell's division, on Hill's left, moved against the left of Kearny's division, and was repulsed by artillery fire alone. Half an hour after Hill had been disastrously repulsed and his troops scattered, McLaw's division of two brigades — Semmes and Kershaw — came up and assaulted Porter's right. Semmes made some headway up the slope, but was met by the 69th and 88th New York of Meagher's brigade, which Sumner had sent to Porter's assistance, and was repulsed after a hand-to-hand encounter. Kershaw, on Semmes' left, was likewise repulsed, and his repulse at twilight marked the close of the battle, but it was 9 o'clock before the firing ceased and quiet settled down on the bloody field. Sixteen Confederate brigades had heroically thrown themselves against the Union left, but were repulsed by the artillery and nine brigades. Advanced regiments were forced back, but generally recovered ground; batteries or parts of batteries were withdrawn, but again run forward; yet "never for an instant was the Union line broken or the guns in danger." The Confederate loss was over 5,500; Jackson's four divisions had 2,301 killed, wounded, and missing; Magruder and Huger about 2,900. The Union loss was less than 2,000. Consult: 'Official Records,' Vol. XI.; Webb, 'The Peninsula'; 'McClellan's Own Story'; Allan, 'History of the Army of Northern Virginia'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. II.

E. A. CARMAN.

Malvern (mâl'vẽrn) **Hills,** England, a range of picturesque hills on the borders of Worcester and Hereford shires. It extends north and south for about 9 miles, and attains an altitude of 1,395 feet in the Worcestershire Beacon.

Mälzel, mĕl'tsĕl, **Johann Nepomuk,** German musical artificer: b. Ratisbon 1772; d. at sea 1838. He invented an orchestrion, and an automatic trumpeter, and was made court mechanician at Vienna in 1808. He died on his way to visit the United States.

Mama'nuas, mä-mä'noo-äs, a Negrito people of the Philippines living in the interior of Surigdo Peninsula, island of Mindanao. Large numbers of them have been converted to Christianity by the Jesuit missionaries. See PHILIPPINE ISLANDS.

Mamaroneck, mạ-măr'ō-nĕk, N. Y., town, in Westchester County; on Long Island Sound, and on the New York, N. H. & H. railroad; about 21 miles east of New York. The town includes the village of Larchmont and part of the village of Mamaroneck. It is a residential section, in which many New York city people have homes. There are but few industrial establishments; the principal are the National Machine Company, manufacturing sewing machines and sewing machine attachments, and employing 80 persons; and a gutta-percha plant, in which 50 persons are employed. It is the headquarters of the Larchmont Yacht Club. Pop. (1910) 5,699.

Mamba'jao, măm-bä'how, a town of the province of Misamis, Mindanao, situated on the northwestern coast of Camigin Island, which lies off the northeast coast of Mindanao. Pop. 18,000.

Mam'ber, a widely diffused colloquial name for the common wild goat (*Capra ægagrus*) of southwestern Asia. See GOAT.

Mambu'sao, măm-boo'sä-ō, Philippines, a pueblo of the province of Cápiz, island of Panay, on the Cápiz River, opposite Ibajay and 17 miles southwest of Cápiz, the provincial capital. It is a military station. Pop. 11,000.

Mamelukes, măm'ĕ-lūks, **Mamlouks,** or **Mamalukes** (from the Arabic *mcmalik,* a slave), in Egypt, slaves from the Caucasian countries, who from menial offices were advanced to dignities of state. When Genghis-Khan made himself master of the greatest part of Asia in the 13th century, and carried vast numbers of the inhabitants into slavery, Nedjmeddin (Malek Salah), sultan of Egypt, bought 12,000 of them, including natives of Circassia, but chiefly Turks, from Capchak (Kipzak), had them instructed in the military exercises, and formed a regular corps of them. They soon exhibited a spirit of insubordination and rebellion. Under his successor they interfered in the government, assassinated the sultan, Turan Shah, and in 1254 appointed Ibegh, one of their own number, sultan of Egypt. The dominion of the Mamelukes in

Egypt continued 263 years. During this period they made some important conquests, and in 1291 they drove the Franks entirely out of the East. From the middle of the 18th century the number and wealth of the Mamelukes gave them such a superiority over the Turks in Egypt that the pasha appointed by the Porte was obliged to conform entirely to their wishes. This superiority was owing principally to Ali Bey, who ruled with unlimited power from 1766 to 1773, when he was assassinated. The Mameluke beys, especially Murad Bey, played an important part at the time of the French invasion. The Mamelukes, who were scattered throughout Egypt, and estimated at 10,000 or 12,000 men, maintained their numbers, principally by slaves brought to Cairo from the regions lying between the Black and Caspian seas. These were compelled to embrace the Mohammedan faith, and were all educated as soldiers. After a time they obtained a share in the government, and some of them even became beys, for none but Mamelukes were capable of holding this office. They formed a fine body of cavalry, and attacked the French, when they landed in Egypt, with the greatest fury; but they were unable to withstand the European artillery, and many of them soon joined the French. The Pasha of Egypt, Mehemet Ali, destroyed the Mameluke beys 1 March 1811, by a perfidious stratagem, and immediately afterward ordered a general massacre of the Mamelukes in every province of Egypt. Some hundreds managed to escape into Lower Nubia, where they built a small town, and endeavored to keep up their force by disciplining negroes in their peculiar tactics. They did not succeed, however, and shortly afterward dispersed. See also EGYPT.

Mammalia. See MAMMALS.

Mammals, a class of animals, known also as beasts, or quadrupeds, the highest of the vertebrate group in the sense that it comprises forms whose organization is on the whole the most efficient on account of the complexity, or perfection, of the various organs and parts. The diagnostic character of the class is the possession of cutaneous glands, which secrete a complex fluid, called milk, for the nourishment of the young. The lower jaw articulates directly with the cranium. The occipital condyles, two in number, form part of the exoccipitals. The internal ear contains a series of three or four separate small bones, which are concerned in audition. The heart is four-chambered, with two auricles and two ventricles; a single left aortic arch; blood warm; red blood disks, not nucleated. A muscular diaphragm separates the heart and lungs from the abdominal cavity. With few exceptions, mammals are clothed with hair, a special outgrowth of the epidermis.

Mammals as a class are extremely diversified in size, appearance and habits. The structure of some is modified for a purely aquatic life, of others for burrowing in the earth, for flying, for leaping, for running, etc. Some live entirely in the sea, others pass their lives in the treetops, and others in subterranean caverns, which they excavate.

All mammals possess limbs, which are normally four in number, but the hind pair is suppressed in the whales and sea-cows. The limbs assume the form of legs for terrestrial progression, wings for flight, or paddles for swimming. The class includes man, and the majority of the animals most useful to man, such as the horse, ox, sheep, goat, dog, cat, etc. It includes also the whales, the largest of existing animals. About 600 genera and 5,000 species of mammals (exclusive of fossil forms) are known, of which about 200 genera and 1,200 species occur in North America, north of Panama.

Integuments.—The skin of mammals consists of two principal layers, a superficial one, called the epidermis or cuticle, and a deeper layer, the dermis or corium. The epidermis is again divided into two layers, an external horny layer and a deeper one, called the Malpighian layer. The epidermis is usually quite smooth, and is beset with hairs which are a special outgrowth of this part of the integument peculiar to the class. The cetacea are without hairs, except a few about the mouth. In the pangolins, the epidermis develops large scales which cover the greater part of the body. Epidermic scales of smaller size are found on the tails of various rodents, insectivores, and marsupials. The horns of ruminants, the nasal horn of the rhinoceros, and all claws, nails, and hoofs are also epidermic structures.

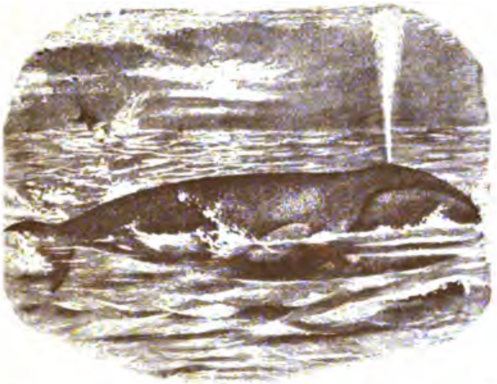
The dermis or corium is generally thicker than the epidermis and contains blood-vessels, tactile nerve endings, sweat glands which open on the surface of the body, and fatty tissue. In the whales and seals the fat cells are enormously developed immediately below the dermis and constitute the «blubber.» In the armadillos bony plates occur in the dermis, forming a carapace or shell. They are covered by horny sheaths. The presence of small hard tubercles in the skin of certain porpoises gives ground for the belief that the ancestors of the cetacea were covered with a bony armor, somewhat like that of the armadillos.

Hair.—True hairs are found only on mammals. They are simple epidermic structures growing from papillæ sunk in the dermis. They consist of central cellular pith, encased in a horny sheath. In some mammals the sheath is rough, and the hair is then capable of being matted together to form «felt.» In the majority of mammals the hairy covering consists of coarse long hairs and fine short hairs intermingled, forming the fur. In the porcupines the coarse hairs assume the form of large stiff spines, or quills; in the hogs they are smaller and more flexible, forming bristles. The hairy covering is usually shed once or twice annually, except the manes and tails of such ungulates as the horse, the hairs of which may persist throughout life.

The majority of mammals have a number of large, long hairs, or vibrissæ, arranged in a definite fashion about the mouth, eyes and ears, which serve to a certain degree as tactile organs. In deer and some other ruminants the hairs consist mainly of the cellular pith and hence are easily broken.

The color of mammals is chiefly due to the pigments contained in the hair, which belong to the class known as melanins. Black, white, and brown in various mixtures and shades are the commonest colors. The coloration is chiefly protective, but some such sharp contrasts of black and white as those of the skunks are thought to be warning colors, and the clear white of the under side of the tail of deer, certain hares, etc., to be directive, or distinguishing, marks for the young.

MAMMALIAN TYPES.



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1. A whale—aquatic type.
2. Antelope—terrestrial type.
3. Bat—aerial type.
4. Ape—arboreal type.

Skeleton.—The skeleton consists of an axial portion, comprising the skull, the backbone or vertebral column, the ribs and the sternum; and an appendicular portion, or the skeleton of the limbs. In the skull the bones are bound firmly together by the overlapping or interdigitation of the edges, except the lower jaw, the ossicles of the internal ear and the hyoid, or tongue, bones. In adults most of the sutures are usually obliterated. The snout or rostrum consists of the intermaxillary, maxillary, palatine and pterygoid bones below and on the sides, and the nasals above, while within are the median vomer and the ethmoid bones. The rostrum abuts against the brain-case or cranium, which is vaulted, and comprises three segments, an anterior one, consisting of the presphenoid, orbito-sphenoids and frontal; a middle segment, consisting of the basisphenoid, alisphenoids, squamosals, and parietals; and a posterior segment, consisting of the basi-occipital, exoccipitals and supraoccipital. The exoccipitals bear the two condyles for articulation with the vertebral column. At the base of the skull, between the occipital and squamosal, are the periotic bones, containing the organ of hearing or internal ear, and the tympanics, which form the bony walls of the orifice of the ear. The tympanics are greatly expanded in whales and some other mammals, forming shell-shaped bullæ.

The vertebral column comprises five sections, the cervical, dorsal (or thoracic), lumbar, sacral and caudal. The cervical vertebræ are seven in number in all mammals, whatever the length of the neck, the only exceptions being the manatees, which have six, and the sloths, which have six, eight or nine. In certain whales, the majority of porpoises and some rodents, the cervicals are more or less united; in the right whales they form a single bony mass. The dorsals vary in number from 9 to 22. Articulated with each is a pair of ribs. The ribs terminate below in cartilages, which sometimes ossify, forming what are called «sternal ribs.» By means of these cartilages the anterior pairs of ribs are connected with the breastbone or sternum, which may consist of a single piece, as in the whalebone whales, or of several segments arranged longitudinally. The posterior pairs of ribs are sometimes called «floating ribs» because their cartilages do not meet the sternum, but are attached to those of the more anterior pairs, or are quite free. The lumbar vertebræ follow the dorsals and are without ribs. In number they vary from 2 to 30 in different forms. The number of dorsal and lumbar vertebræ combined is quite constantly 23 in the odd-toed ungulates (horse, rhinoceros, tapir, etc.), 19 in even-toed ungulates (deer, ox, sheep, etc.), and 20 or 21 in carnivores and most insectivores. Man, the higher apes and many bats have 17. Following the lumbars is the sacrum, consisting usually of three vertebræ joined together and connected with the pelvis. This region is not distinguishable in the whales and sea-cows, which lack hind limbs. The caudals, or tail-vertebræ, complete the column. In man, and in certain apes and bats they are three in number and rudimentary, but as many as 46 are present in the long-tailed pangolins. In the intervals between the anterior caudals below are situated small V-shaped bones, called chevrons, whose chief function is to protect the larger blood-vessels of the tail. They are especially well developed in the whales and edentates.

In many groups of mammals the anterior limbs are connected with the axial portion of the skeleton through the pectoral girdle, consisting of the shoulder blades, or scapulæ, and the collar-bones or clavicles. The scapula is not attached directly to the vertebral column, but its acromion process is joined to the anterior end of the breastbone, or sternum, by means of the clavicle. Clavicles are wanting in all seals, whales, sea-cows and ungulates, and are rudimentary or wanting in various representatives of several other groups. They are present in man and, with one or two exceptions, in all monkeys, bats, insectivores and marsupials. The upper-arm bone, or humerus, articulates superiorly with the scapula, and below with the two bones of the fore-arm, the radius and ulna. In the majority of mammals the radius, or outer bone, is permanently crossed over the ulna at the lower end, as is especially well seen in the elephants. In man and a few other forms the radius can be rotated. Following the fore-arm is the wrist or carpus, consisting of two rows of small bones, which, however, are variously united in different forms; and finally the digits, which are normally five in number, each consisting when fully developed of a metacarpal bone and three other bones, called phalanges, though the first digit, or thumb, usually has but three in all. In man and apes the thumb is opposable to the other digits. In many mammals this digit and also the fifth are greatly reduced, or entirely wanting. In the ruminants, such as the pig, ox, deer, camel, etc., the first digit is wanting, and the 2d and 5th are reduced in size, or entirely lacking, while the 3d and 4th are equal in length and well developed. In the odd-toed ungulates, such as the horse, rhinoceros, tapir, etc., the 3d digit is longest, the others being reduced in length, rudimentary, or wanting. In ungulates the metacarpals are usually much elongated and in such ruminants as the deer, ox, etc., are united, forming what is known as a «cannon bone.» The cetacea are peculiar in that the bones of the fore-limb are not movably articulated and that the phalanges of the middle digits often greatly exceed three. In bats the phalanges are very greatly elongated to give support to the wing membranes.

The hind-limb is connected with the vertebral column through the pelvic girdle, which is united with the sacrum. The bones of the hind-limb, which are homologous to those of the fore-limb, are the femur or upper leg-bone, the tibia and the fibula or lower leg-bones, the tarsal or ankle bones, and the metatarsals and phalanges, constituting the hind-foot. The peculiarities of the bones of the fore-feet in ungulates, already mentioned, are found also, with only slight modifications, in the hind-feet.

The terminal phalanges of both fore and hind feet are compressed and pointed in beasts of prey and such as climb or dig, forming claws, which are covered with horny sheaths. In large running mammals, the terminal phalanges are more or less broad and flat and likewise covered with horny sheaths, forming hoofs or nails. Certain bones not connected with the skeleton, such as the *os penis*, *os cordis*, etc., are developed in the viscera of various mammals.

Teeth.—In mammals, unlike the lower vertebrates, teeth are not produced indefinitely, but in fixed number. Only two sets are developed. The first, called the milk dentition, appears during infancy, being replaced by the second set, called the permanent dentition, as maturity is reached. The milk teeth are less numerous and usually smaller than those of the permanent set. Teeth occur only in the premaxillary and maxillary bones, and the mandible or lower jaw. The upper teeth are divided into incisors, which are implanted in the premaxillæ; canines, which are almost invariably simple and stand immediately behind the suture between the premaxillæ and maxillæ; and premolars and molars, which occupy the edges of the maxillæ. The premolars have "milk" predecessors, while the molars have not. The nomenclature of the teeth of the lower jaw is the same as for those of the upper jaw, their character being determined by their relation to the latter and by their form and mode of development. While the greatest diversity exists as to the form of the individual teeth, and the development of the dentition as a whole, there are rarely more than 44 in all. The exceptions are among the marsupials, where the number rises to 54 in the marsupial anteater, *Myrmecobius,* and to 64 in a fossil form, *Amphitherium;* also among the cetacea, one species of which has as many as 246 simple teeth. The true anteaters, *Myrmecophagidæ,* and the spiny anteater of Australia, *Echidna,* are without teeth at any time, but many mammals which do not possess them when adult, have rudimentary teeth in the fœtal stages. Such is the case with the whalebone whales; and with the platypus, *Ornithorhynchus.* The rudimentary teeth in these disappear early and are replaced by whalebone in the case of the whales, and by horny plates resembling teeth, in the platypus.

Teeth consist of two portions, the root and the crown. When most complex they contain three structural elements, the enamel, the dentine and the cement. The enamel is hardest and is restricted to the crown, while the dentine makes up the mass of the tooth, and the cement usually surrounds the root, or fills spaces between the enamel-folds of the crown. The enamel develops from the epithelial tissue of the jaws, the dentine from the deeper-lying areolar tissue, and the cement from the walls of the tooth-capsule. Some teeth, such as the incisors of rodents, the tusks of the elephant, etc., grow continuously during life; others complete their growth early. Especially remarkable forms of teeth are the tusks of elephants, which are incisors, and the tusks of the narwhal, the boar and the babirussa, which are canines. When the crowns of the teeth greatly exceed the roots, as in the horse, the teeth are said to be hypsidont or hypselodont; when the reverse is the case, the teeth are called brachydont. Teeth having the crown in the form of tubercles, as in the hog, are called bunodont; those with transverse ridges, as in the ox, many rodents, etc., are called lophodont.

Alimentary Canal.—The mouth, or entrance to the alimentary canal, contains the tongue, which in the majority of mammals is so attached below that it can be protruded but a short distance, but is often sufficiently free to be used in grasping food and turning it about in the mouth during the process of mastication. In those mammals which feed upon ants and termites, such as the anteaters, pangolins, etc., and also in certain fruit-eating bats, the tongue is very long and slender and can be extended far beyond the mouth. On the posterior surface of the tongue are the organs of taste, and the upper surface is often roughened by horny papillæ. A number of large glands, called salivary glands, open into the mouth. Their function is to moisten the food and initiate the process of digestion. The glands most constantly present are the parotid, situated at the base of the ear, and opening inside the cheek, and the submaxillary, situated near the angle of the lower jaw, and opening under the apex of the tongue. At the back of the mouth is the entrance to the œsophagus or gullet, usually a simple tube, leading to the stomach. The stomach is an oblong, curved sac, usually enlarged at the cardiac end where the œsophagus is attached, and smaller at the lower, or pyloric, end, where it joins the intestines. It is usually simple, but in the ruminants and the cetaceans consists of several chambers. The intestines join the stomach at the pyloric end. They are usually of great length, and divided into two distinct sections. The portion nearest the stomach, called the small intestine, is joined below by one of larger diameter called the large intestine. The upper end of the latter is frequently dilated, forming a pouch called the cæcum, which in herbivorous mammals, and notably in rodents and many ungulates, is greatly enlarged or elongated. In man, the higher apes and the marsupial wombat it terminates in a narrow prolongation called the vermiform appendix. Different sections of the small intestine have received the names duodenum, jejunum and ileum; and of the large intestine, colon and rectum. The inferior orifice of the intestines is the anus or vent. Generally speaking, the intestines and cæcum are shortest in carnivorous mammals and longest in such as are vegetable feeders, but the carnivorous whales and seals, which have long intestines, form a conspicuous exception.

Besides the numerous glands situated within the intestine, are two large ones, the liver and the pancreas, whose ducts open into the intestines near the stomach. The liver is a large, flat gland, which may be divided merely into a right and a left lobe as in man, the cetacea and ruminants, or may have these lobes again subdivided into two by a longitudinal fissure. Two smaller lobes, called the Spigelian lobe and the caudate lobe, are commonly added. Attached to the liver is the gall-bladder, which is, however, absent in the cetacea and some other orders.

Kidneys.—The kidneys, whose function is to secrete urine, are situated in the upper part of the abdominal cavity near the vertebral column. They are two in number, oblong and usually simple, but in the cetacea, and also in bears and seals, are divided into separate lobules. A duct or ureter leads from each kidney to the urinary bladder, from which in turn a common duct, called the urethra, leads to the exterior of the body. In the monotremes, however, the ureters do not enter the bladder, but into a common urogenital passage or cloaca.

Lungs.—The lungs are situated in the thorax, which is cut off below from the abdominal cavity by a muscular diaphragm whose action assists in the process of breathing. The lungs consist of two spongy lobes, a right and a left, which are free below, but attached above to the two principal divisions of the windpipe. In the cetacea and sea-cows, the lobes are simple externally, but in other orders are more or less subdivided. A third median lobe, called the azygos lobe, is present in some groups. Air breathed in through the nostrils reaches the lungs through the trachea or windpipe, the upper end of which, the larynx, lies in the throat. Its orifice, the glottis, is protected by a cartilage, called the epiglottis, which prevents particles of food from entering the windpipe. The larynx is made up of cartilages, of which the largest are the thyroid, the cricoid and the arytenoid. Within the larynx are the vocal cords, two parallel elastic, fibrous bands, whose vibrations produce the voice. The lower end of the windpipe divides into two smaller tubes, or bronchii, each of which enters a lobe of the lungs and subdivides into numerous smaller branches. A third bronchius, which enters the right lung, occurs in some cetaceans and ruminants.

Heart.—The heart in mammals is four-chambered, consisting of two thin-walled auricles and two ventricles, both with thick walls, but the right, which supplies only the lungs, thinner than the left. There is no direct communication between the left and right sides of the heart after birth. The valve between the right auricle and the right ventricle is tendinous, except in the monotremes.

The aorta, or principal artery, bends toward the left immediately beyond its connection with the heart and gives off the innominate, left common carotid, and brachial arteries, which, with their branches, supply the head and anterior limbs. Blood is carried from the alimentary canal to the liver by a single vein, except in the monotremes, in which as in lower vertebrates the abdominal vein is present. The kidneys are supplied with blood only by the renal arteries.

Brain.—Except for certain fossil forms, the brain of mammals is characterized by its relatively larger size as compared with that of lower vertebrates, and especially by the magnitude of the cerebral hemispheres and the perfection of the connections between them. In most mammals the surface of the brain is divided by numerous irregular fissures and convolutions. They are absent only in small bats, rodents, and insectivores, and in the *Ornithorhynchus*. The largest forms in each order, generally speaking, exhibit the greatest complexity, and there has been a remarkable development in the class in this direction since Tertiary times. The cetacea have very large and complex brains, though they are small relatively, when compared with the size of the body.

Sense Organs.—The organs of sense, except that of touch, are located in the head. The sense of touch is generally distributed over the skin, but is most acute in the snout, and in the extremities, except when used merely in locomotion. The wings of bats and the prehensile tails of monkeys are also especially sensitive. Some burrowing mammals, such as the mole, have imperfect eyes, the optic nerve being more or less atrophied. The Indian river-dolphin, *Platanista*, is a blind form, having rudimentary eyes, without crystalline lenses. The mammalian ear is characterized, beside the chain of ossicles, already mentioned, by the complex cochlea, which is usually spirally convoluted. The tympanic membrane, or eardrum, seals the auditory chamber from without. In the majority of mammals the external orifice of the ear is surrounded by a fold of skin, called the pinna or external ear. These are absent in cetaceans, sea-cows, seals, etc., which live in the water, and also in some burrowing mammals.

Reproductive System.—In mammals the female reproductive organs comprise the ovaries, Fallopian tubes or oviducts, uterus and vagina. The ovaries are two in number, a left and a right. Approximated to them are the Fallopian tubes, which widen below and form the uterus. In the lower mammals the uterus of each side is separate, but the two unite below in a common vagina, while in the higher groups, the uterus and vagina are both single. The male organs comprise the testes, spermatic cord, and penis. In cetaceans, sea-cows and seals, which are aquatic, and in the elephants, conies and many edentates, the testes are internal in position, but in most other forms they descend periodically, or permanently, into a pouch of the integument, called the scrotum. The structure of the penis in mammals is peculiar to the class. An *os penis* is present in the majority of bats, insectivores, rodents, carnivores and primates.

During development the mammalian fœtus is nourished through a complex structure, called the placenta, formed in part by the internal wall of the uterus of the mother and in part by the membranes of the fœtus itself. The placenta is characteristic of the class as a whole, but is not found in the monotremes, or in most marsupials. The form and other characteristics of the placenta differ in the several orders of mammals and are regarded as of importance in classification.

Distribution.—The geographical distribution of existing mammals, as of other animals, is the result of varied conditions and influences, some transient and others of long continuance, beginning in the relatively remote geological times when the class first made its appearance. Among the principal factors in the problem of distribution may be included changes in the extent and configuration of the land areas of the globe, changes in climate and in food supply, the appearance and disappearance of enemies, and latest, but by no means least, the interference of man. These and other factors in distribution are considered under the heading GEOGRAPHICAL DISTRIBUTION OF ANIMALS. It is only possible here to mention some of the more important facts in the distribution of mammals. Of widest distribution are the purely aquatic orders, the cetacea and pinnipedia, whose range covers all seas and reaches from pole to pole, but it should be noted that no sea-lions occur in the North Atlantic. Next follow the bats, whose range is nearly world-wide, but they do not enter the antarctic zone, and only very few species cross the arctic circle. On the other hand, they are found in New Zealand and in oceanic islands where no terrestrial indigenous mammals occur. Of the purely terrestrial orders, the rodents have the widest range, covering every continent and reaching from the arctic zone to Patagonia and Tasmania. Carnivores, like rodents, have an almost world-wide distribution, but in Australia only one species of the order occurs, the dog known as the "dingo," *Canis dingo;* and it is uncertain whether this may not have been introduced by man at a remote date. The monotremes (comprising only the genera *Ornitho-*

rynchus, Echidna and *Proëchidna*) are limited to Australia, Tasmania and New Guinea. Marsupials occur only in Australia, Tasmania, New Guinea and America. The American marsupials, with the exception of one genus, all belong to the family *Didelphiidæ*, or the opossums. Edentates occur only in America, southern Asia and Africa. They have their greatest development in South America. One genus, *Tatu*, extends northward into Texas. Ungulates inhabit all continents except Australia, but only two or three species enter South America. Of the two groups forming the order *Primates*, the lemurs and lemuroids occur only in Madagascar, Africa and southern Asia, while monkeys inhabit only Africa, southern Asia, and South and Central America. One ape, *Macacus inuus*, is found at Gibraltar, but it is only doubtfully indigenous.

Fossil Mammals.—Mammals are believed to have originated as an off-shoot from certain Permian and Triassic reptiles called *Theromorpha* or *Anomodontia*. The earliest recognizable remains of mammals are certain small teeth and jaw-bones found in the Triassic formations. They belonged to forms resembling monotremes and marsupials in some characters, but are usually placed in a separate order, called *Allotheria* or *Multituberculata*. Representatives of the *Allotheria* continued on through the Jurassic and Cretaceous. The existing orders of mammals first appear in the Eocene, the lowest formation of the Tertiary period, being foreshadowed in the lowest beds of that period by certain generalized groups such as the *Creodonta* and *Condylarthra*. The Eocene also contains remains of several groups, or suborders, of ungulate mammals, which have no living representatives. These are the *Ancylopoda, Typotheria* and *Toxodontia*.

The later Tertiary and the Quaternary periods show a greatly increased number and diversity of forms. Many of them represent families which persisted fot only a relatively short period and are now extinct; others have continued to the present. Among the oldest of existing genera are *Didelphis* (opossum), *Sciurus* (squirrel), *Myoxus* (dormouse), *Sorex* (shrew), *Vespertilio* and *Vesperugo* (bat), and *Viverra* (civet), which originated in the Eocene; *Tapirus* (tapir), *Rhinoceros, Giraffa* (giraffe), *Elephas* (elephant), *Sus* (pig), *Talpa* (mole), *Erinaceus* (hedgehog), *Mustela* (marten), *Lutra* (otter), *Hyæna, Felis* (cat), and *Phoca* (seal), which originated in the Miocene.

Classification.—The class *Mammalia* was divided by Linnæus into three principal sections, *Unguiculata, Ungulata*, and *Mutica*. The last comprises the cetaceans, the second all the ungulates except the elephant; and the first, the remainder of the class. This classification was replaced by Blainville, who proposed on embryological grounds to divide the class into *Monodelphia*, or mammals with a placenta; *Didelphia*, or mammals without a placenta (the marsupials), and *Ornithodelphia*, or the monotremes. Richard Owen combined the last two subclasses under the name of *Eplacentalia*, and gave the placental mammals the name of *Placentalia*. Speculation as to the origin of the class as a whole led Huxley to propose as the source, a hypothetical group which he named *Hypotheria*, the characters assigned being the absence of milk glands and of a corpus callosum in the brain, and the presence of a quadrate bone for the articulation of the mandible. Existing mammals were divided into *Prototheria*, comprising the monotremes, *Metatheria*, the marsupials, and *Eutheria*, the so-called placental mammals. Cope in 1889, while retaining the subclass *Prototheria* for the monotremes, placed the entire remainder of the class in the subclass *Eutheria*. Flower and Lydekker (1891) adopt Huxley's divisions, while Beddard (1902) makes use of those of Cope. Flower and Lydekker's arrangement of families and higher groups is as follows (fossil groups printed in italics):

- Subclass 1. PROTOTHERIA.
  - Order 1. Monotremata (Monotremes).
    - Families: Ornithorhynchidæ, Echidnidæ.
  - (Group, *Multituberculata* or *Allotheria*.
    - Families: *Plagiaulacidæ, Polymastodontidæ, Tritylodontidæ.*)
- Subclass 2. METATHERIA.
  - Order 2. Marsupialia (Marsupials).
    - Suborder 1. Polyprotodontia.
      - Families: *Dromatheriidæ, Amphitheriidæ, Spalacotheriidæ*, Didelphyidæ, Dasyuridæ, Peramelidæ.
    - Suborder 2. Diprotodontia.
      - Families: Phascolomyidæ, Phalangeridæ, *Diprotodontidæ; Nototheriidæ*, Macropodidæ.
- Subclass 3. EUTHERIA.
  - Order 3. Edentata (Edentates).
    - Families: Bradypodidæ, *Megatheriidæ*, Myrmecophagidæ, Dasypodidæ, *Glyptodontidæ*, Manidæ, Orycteropodidæ.
  - Order 4. Sirenia (Sea-cows).
    - Families: Manatidæ, *Rhytinidæ*, Halicoridæ, *Halitheriidæ*.
  - Order 5. Cetacea (Cetaceans).
    - Suborder 1. Mystacoceti (Whalebone whales).
      - Family: Balænidæ.
    - Suborder 2. *Archæoceti.*
      - Family: *Zeuglodontidæ.*
    - Suborder 3. Odontoceti (Toothed whales).
      - Families: Physeteridæ, Platanistidæ, Delphinidæ.
  - Order 6. Ungulata (Hoofed mammals).
    - Suborder 1. Artiodactyla (Even-toed ungulates).
      - Families: Hippopotamidæ, Suidæ, *Chæropotamidæ, Anthracotheriidæ, Merycopotamidæ, Cotylopidæ, Anoplotheriidæ, Dichodontidæ*, Tragulidæ, Camelidæ, *Poebrotheriidæ*, Cervidæ, Giraffidæ, Antilocapridæ, Bovidæ.
    - Suborder 2. Perissodactyla (Odd-toed ungulates).
      - Families: Tapiridæ, *Lophiodontidæ, Palæotheriidæ*, Equidæ, Rhinocerotidæ, *Lambdotheriidæ, Chalicotheriidæ, Titanotheriidæ, Macraucheniidæ.*
    - Suborder 3. *Toxodontia.*
      - Families: *Toxodontidæ, Typotheriidæ.*
    - Suborder 4. *Condylarthra.*
      - Families: *Periptychidæ, Phenacodontidæ Meniscotheriidæ.*
    - Suborder 5. Hyracoidea (Conies).
      - Family: Hyracidæ.
    - Suborder 6. *Amblypoda.*
      - Families: *Pantolambdidæ, Coryphodontidæ, Uintatheriidæ.*

- Suborder 7. Proboscidea (Elephants).
  - Families: *Dinotheriidæ*, Elephantidæ.
- (Group *Tillodontia*.)
  - Families: *Anchippodontidæ*, *Calamodontidæ*.)
- Order 7. Rodentia (Rodents)
  - Suborder 1. Simplicidentata.
    - Families: Anomaluridæ, Sciuridæ, Haplodontidæ, *Ischyromyidæ*, Castoridæ, Myoxidæ, Lophiomyidæ, Muridæ, Spalacidæ, Geomyidæ, Dipodidæ, *Theridomyidæ*, Octodontidæ, *Castoroididæ*, Hystricidæ, Chinchillidæ, Dinomyidæ, Caviidæ, Dasyproctidæ.
  - Suborder 2. Duplicidentata.
    - Families: Lagomyidæ, Leporidæ.
- Order 8. Carnivora (Carnivores).
  - Suborder 1. Carnivora vera (Fissipeds).
    - Families: Felidæ, Hyænidæ, Protelidæ, Viverridæ, Canidæ, Ursidæ, Mustelidæ, Procyonidæ.
  - Suborder 2. Pinnipedia (Pinnipeds).
    - Families: Otariidæ, Trichechidæ, Phocidæ.
  - Suborder 3. *Creodontia*.
    - Families: *Hyænodontidæ*, *Proviverridæ*, *Arctocyonidæ*, *Mesonychidæ*.
- Order 9. Insectivora (Insectivores).
  - Suborder 1. Insectivora vera.
    - Families: Tupaiidæ, Macroscelididæ, Erinaceidæ, Soricidæ, Talpidæ, Potamogalidæ, Solenodontidæ, Centetidæ, Chrysochloridæ.
  - Suborder 2. Dermoptera.
    - Family: Galeopithecidæ.
- Order 10. Chiroptera (Bats).
  - Suborder 1. Megachiroptera.
    - Family: Pteropidæ.
  - Suborder 2. Microchiroptera.
    - Families: Vespertilionidæ, Nycteridæ, Rhinolophidæ, Emballonuridæ, Phyllostomatidæ.
- Order 11. Primates.
  - Suborder 1. Lemuroidea (Lemurs and Lemuroids).
    - Families: *Hyopsodontidæ*, Chiromyidæ, Tarsiidæ, Lemuridæ.
  - Suborder 2. Anthropoidea (Monkeys and Man).
    - Families: Hapalidæ, Cebidæ, Cercopithecidæ, Simiidæ, Hominidæ.

The groups of existing mammals whose structural peculiarities are such as to entitle them to rank as separate families vary greatly as regards the number of genera and species they comprise, some being represented by a multitude of different forms, while others consist only of a single species, or a single genus with but a few species. Families consisting of only a single genus and species are as follows: the *Chiromyidæ*, established for the reception of the Aye-Aye, a singularly modified lemuroid mammal, confined to Madagascar; the *Dinomyidæ*, comprising only a large Peruvian rodent, somewhat like a paca, of which a single specimen is known; the *Antilocapridæ*, represented only by the Prong-horn of the western plains of North America; the *Notoryctidæ*, comprising only a small mole-like marsupial recently discovered in South Australia; the *Ornithorhynchidæ*, comprising only the Platypus, or Duckbill, of Australia. These and other restricted families are to be looked upon as fragments of groups of genera and species, of which the greater number are extinct, or as branches from main lines of development which have never progressed and ramified.

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Mammary Glands, the milk-glands of mammalian animals (see Breast). They are present in all mammals, in both sexes, but in the male are usually rudimentary, their functional activity being limited to the female, who secretes in these glands the milk for nourishing her young during a natural period after birth. In all mammals they are placed in pairs, but vary much in position and number in different groups. Zoologists give them names according to their position near the armpits (axillary), on the chest (pectoral), on the belly (ventral or abdominal), or near the groin (inguinal). They are never situated on the back. The number in an individual may be from two to twelve or more, and is usually even. The structure of the cow's udder is due to the uniting of the same number of mammæ as there are of teats, the number of which, when more than two, usually corresponds to that of the young produced at each birth. The mammary glands of *Marsupialia* (q.v.) are contained in the pouch. In monotremes — duckbills and echidnas — the nipple is not present. (See Prototheria.)

Diseases of the Mammary Glands.— The common inflammation of the glands (mastitis) is often attended by much swelling, with fever and painful tenderness. The formation of pus is apt to result in a slowly pointing abscess. Great care in diet and regulation of the bowels should be observed. Purgatives and fomentations may be necessary, also in many cases the placing of the arm on the affected side in a sling. Drawing off the milk and evacuating the pus may be practicable, and will afford great relief. Pain in the breasts (mastodynia) may result from many causes, of which sore nipples is one of the most frequent. The nipples are also subject to cracks, ulcerations, etc., which occasion much difficulty and pain to the mother when suckling the child. Lotions of an astringent character, as tannin, etc., have a remedial effect in such disorders, as have also collodion and lunar caustic (nitrate of silver), when applied to the sore nipple. Metallic shields are used in severe cases for protection of the affected point. Among many specific disorders to which the mammary glands are liable are cancer and galactocele and other forms of tumor. See Milk Fever.

Mammee' Apple, or South American Apricot, the fruit of a clusiaceous tree, bearing white, showy, fragrant flowers, growing naturally in tropical America, but largely cultivated in tropical parts of the Old World. The fruit is several inches in diameter, with a double rind and a yellowish pulp like that of an apricot, which is sweet and nourishing, and is eaten raw or with wine and sugar, or is boiled. A spirituous liquor called Eau Créole, is distilled from its flowers; and the gum exuding from the bark is used by the Central Americans for destroying chigoes in the feet. This gum-resin is similar to the "gamboge," derived from a closely related West African tree (*Garcinia hamburyi*).

Mammon, a term popularly held to be a mere personification of riches. It is used in

Matt. vi. 24 and Luke xvi. 9. Milton makes Mammon a fallen angel of sordid character.

Mammoth, an elephant (*Elephas primigenius*) which inhabited the temperate parts of the northern world during the Glacial period, and at its close spread northward with the retreat of the ice, and survived until the Neolithic period of human history. Some account of the origin and probable wanderings of the species is given in the paragraph relating to fossil elephants under ELEPHANT. Mammoth remains have been found in intimate association with the handiwork of savage man; and upon a piece of bone a portrait of this animal was found scratched, the accuracy of which shows a close acquaintance by the Cave-dwellers of France with the animal in life, and much artistic skill. This elephant, although the word «mammoth» has become an expression for hugeness, was little if any larger, on the average, than the modern Asiatic elephant, to which it was nearly related. Its remains are abundant and enable us to reconstruct its form and features completely, especially since the remarkable discovery, first in 1799, of carcasses frozen into the icy cliffs along the Arctic coast of Siberia. The latest and most important discovery of this kind occurred in 1901. Since the earliest known times ivory from buried tusks of these animals has been obtained from northern Siberia and Alaska, and many curious stories were invented to account for its origin, especially among the Chinese, who had never seen an elephant; but the specimens above mentioned contained not only the tusks still in their sockets, and every bone in its place throughout the skeleton, but a great part of the flesh was in a condition fit for sledge-dogs to eat and enjoy, and was covered with thick skin still clothed with long dark hair, beneath which was a dense woolly fur, well fitted to protect the animal against arctic cold. The ears were much smaller than those of modern elephants. This specimen of 1901, which is preserved in the Royal Museum at St. Petersburg in the attitude in which it was found buried, measured 16 feet 4 inches from the forehead to the extremity of the tail; its height was 9 feet 4 inches; and the tusks, along the outer or greater curve, measured 9 feet 6 inches. Of other well-known specimens, that skeleton mounted in Chicago is one of the largest known, and its tusks measure 9 feet 8 inches. The largest tusks on record are a pair found in Alaska, which measure 12¾ feet in length. All mammoth tusks show an outward and upward sweep very distinct from the growth of elephant tusks. The mammoth seems to have been extremely numerous all over northern Europe, Asia and North America, especially during post-glacial times, when northern Asia was covered with pine forests to the borders of the Arctic Sea, affording plentiful food in their leaves and twigs upon which these animals browsed. The disappearance of these forests, due to slow climatic changes, is supposed to be the principal influence which led to the extermination of the species, a fact otherwise not easily to be explained. It is probable that human hunting had much to do with the mammoth's final disappearance. Consult: Beddard, 'Mammalia' (1902); Lucas, 'Animals of the Past' (1901). Compare MASTODON.

Mammoth Cave, Ky., a remarkable American cavern, in Edmondson County, 85 miles southwest of Louisville, reached by a small branch line connecting at Glasgow Junction with the Louisville & Nashville railroad. Its areal diameter is about 10 miles, and about 100 miles of passage-way have been explored, including avenues, chambers, pits, domes and rivers. What is termed the Main Cave is three miles long, varying in width from 40 to 175 feet, and in height from 40 to 125 feet. Its greatest enlargement is known as the Chief City (or Temple), an oval room 541 feet long, 287 feet wide, and 125 feet high; anciently a rendezvous of the Indians, whose torches and other relics have been found in abundance. The Star Chamber mimics the starry heavens by reason of its lofty ceiling of black oxide of manganese flecked by snowy crystals of gypsum. The cavern exists in five successive tiers, through which, at various points, shafts have been cut, which are styled pits or domes, according to the point of view. The largest are the Bottomless Pit, Gorin's Dome, the Mammoth Dome, and the Maelstrom, and their average depth is about 100 feet. Oval depressions, locally known as «sink-holes,» drain through the pits and chasms, and form subterranean lakes and rivers; which finally find an outlet to the neighboring Green River. The largest, the Echo River, gets its name from the wonderful reverberations of sound along its course. Boats are provided for short voyages. Eyeless fish abound, of which there are three or four species; besides, blind crawfish, blind crickets, flies, beetles and spiders, and other abnormal fauna, are found on the walls and under the rocks. The structure and habits of these animals have been studied with great care.

Beyond River Hall long avenues extend, many adorned by marvellous gypsum rosettes and brilliant arches of crystal efflorescence in the most fantastic diversity. Cleveland's Cabinet is frequently mentioned as a treasure-house of cave flowers; but some of the smaller rooms, for instance, Charlotte's Grotto, can boast of finer displays. The great cavern is said to end at Croghan's Hall, where is the Maelstrom already mentioned, but the few who have dared go to the bottom of this profound abyss report wide and long avenues beyond, which are yet to be explored. Everywhere, even in the deepest pits, the atmosphere is both chemically and optically pure; the temperature is uniformly about 54° F., all the year around, as has been determined by a long series of exact scientific observations, in order to discover the temperature of the crust of the earth.

The discovery of the Mammoth Cave is usually credited to a hunter named Hutchins, in 1809; but the present manager of the estate finds that the county records, in 1797, fix the entrance to this cavern as a landmark for a piece of real estate. The locality first gained notoriety by reason of its immense deposits of saltpeter, which were used in the manufacture of gunpowder, during the War of 1812. After passing through the hands of several owners, the cave was bought by Dr. John Croghan, who willed it to his nephews and nieces, with instructions that at their death it should be sold at auction. An earnest wish has been expressed by many that the famous cavern should even-

tually become a State or National park. See also CAVES; CAVE ANIMALS. H. C. HOVEY,
Author of 'Celebrated American Caverns.'

Mammoth Hot Springs. See YELLOWSTONE PARK.

Ma'mo, a bird (*Drepanis pacifica*) of the Hawaiian Islands, related to the creepers, and now nearly extinct because of the great demand in past years for their yellow feathers for making the feather-cloaks formerly worn as insignia of royalty by the chiefs. Other birds supplied certain other required feathers. Very few of these cloaks remain in museums.

Mamoré, mä-mō-rā', a river of Bolivia which has its rise in the Cordillera Real, near Sucre, and flows first east by south, then forms almost a semicircle toward the north to Trinidad, from where its course is nearly north to where it units with the Beni and forms the Madeira River. In the first part of its course it is called Rio Grande. The Mamoré is about 1,300 miles long and navigable for about 1,000 miles, with some obstructions. About 40 miles above its junction with the Beni are the Guajara Falls, above which navigation is free for about 400 miles to places where fallen logs have filled in between the banks and formed dams.

Mam'palon, an aquatic animal (*Cynogale bennetti*) of Borneo, of the civet family. It is otter-like in form, is about 18 inches long, has stout webbed plantigrade feet, and is thoroughly adapted to an aquatic life while retaining purely viverrine characteristics of structure.

Man (*Homo sapiens*), the most highly developed of the animals of the earth, differing from the other creatures in intellectual and spiritual nature, but so closely resembling them in physical organism that it is perfectly clear from the point of view of the comparative anatomist that he is not to be separated from the animal kingdom. Physiologically the distinction between man and the anthropoid ape is slight. As to the place of man in the animal kingdom there is some doubt, largely a matter of technical nomenclature. The point at issue is whether man is to be put in a separate order, and, if not, just what higher animals are to be included in the same order with him. The view that man is to be grouped with the anthropoid apes is taken by Huxley, Darwin, and Haeckel, all following Linnæus; it is the predominant view, and classes man with the apes in the order *Primates*. Sir Richard Owen, who followed Cuvier, was the foremost scientist of the 19th century to classify man as a separate order of the mammals, the *Bimana* in opposition to the *Quadrumana*. The order of *Primates*, to take the more authoritative classification, is divided into: the *Lemuridæ*, of which the lemurs (q.v.) are typical; the *Simiadæ*, including the «higher» apes; and the *Anthropoidæ*, Man. The question as to the demarkation and the interrelation between the last two classes then arises. Comparative embryology may furnish some clue to this in the future; at the present the development of the embryo of the simians is almost entirely unknown. Geology and palæontology on the other hand not only have furnished no great assistance to this problem, but in the nature of the case are not likely to do more in the future. Haeckel's *Pithecanthropus* is little more than nomenclature; and it is only in minor degrees that the lowest form of man approaches the most highly developed ape. Haeckel urges the contrast between the snub-nosed human races and the nose ape (*Semnopithecus nasicus*), and holds that the latter has a better claim to being created in the divine image; but this argument scarcely affects the case, for the points are not typical, and the evidence not so conclusive as skeletal identities, for instance, would be.

But if identities and approximate resemblances are hard to find, the distinguishing marks, especially anatomically, are evident. Foremost is the erect position of man as contrasted with the carriage of the apes. For no ape assumes a perfectly erect posture, and the attempts of the ape to stand erect are brief as well as unsuccessful. The human skeleton shows an obvious adaptation for the erect posture; the pelvis is wider than it is broad, and is shorter and stronger than in the ape; the articulations of the thigh are wider apart because of the breadth of the sacrum; the femur is longer than in any other animal and much more nearly in the same line with the axis of the trunk; and the spine has a double curve, which makes the erect posture possible. The human skull, however, exhibits the most striking differences from that of the ape. In the first place it is differently balanced, less of the mass of the head lying anterior to the line of the spinal cord, and much of the brain being posterior to the occipital condyles. Secondly, the facial bones are elongated downward and do not project forward. This difference may be due to the difference in posture noted above; the projection of the lower part of the ape's head makes it possible for the ape to look horizontally when on all fours, and to look up when in the semi-erect posture of tree-climbing, for example. The cranial capacity of the lowest savages averages about 100 per cent more than in the biggest-headed apes; hence the facial angle is entirely different. The difference between the hand of man and of the ape, and the distinctly plantigrade locomotion of man as opposed to the movement of the ape are further distinctions.

With these and other anatomical differences it is probably nearer the truth to consider man as the product of evolution from an ancestor common to him and to the simians, no matter how anthropoid the latter, than to make him, as hostile and superficial critics of Darwin would have it that evolution made him, a direct descendant of any ape. This is hinted by other important facts; thus the dentition of man is nowhere closely paralleled among the so-called *Quadrumana*, save in the case of a lemur, *Tarsius*, which alone has no intervals between the canines and the adjoining teeth, and which in no other respects bears any striking resemblance to man. The Darwinian Theory (q.v.), in so far as it was concerned with the descent of man, put stress on his ultimate and less immediate ancestry and on the steps in this development, urging, in brief, a line of evolution from naked molluscan Ascidians, successively through lower fish forms, ganoid fish, amphibians, reptiles and birds to the lower mammal form, and thence to the highest. This theory finds, perhaps, its most overwhelming proofs in comparative embryology, as in Haeckels 'Evolution of Man.' As to tracing man's genealogy further back, even Lord Rayleigh, a notable defender of biogenesis, thinks that life upon the earth originated from mosses from other worlds, in brief, that animal life is a continuation or evolution of vegetable life — a conclusion to which the very difficulty of drawing a hard and fast line between the two naturally leads. The attempt to carry back man's ultimate ancestry still further is to be found in the theory of abiogenesis (a term introduced by Huxley in place of the less exact «spontaneous generation»). This theory is urged both by Huxley and by Haeckel, notably in his 'Riddle of the Universe' (1900); and to the same end tend the apparently successful experiments in America of Loeb and others, who would show a close connection between electro-chemic phenomena and nervous force or life itself.

The life habits of prehistoric man, as well as his antiquity on the earth, are known almost entirely from fossil remains of various sorts. The data, however, are perplexingly scanty and insufficient for strictly logical deduction. Thus, although the general character of the Neanderthal skull, as Taylor says, «is less human and more simian than any other known skull . . . its precise age is doubtful, and it would be unsafe to regard it as the type of a special race since its characteristics . . . have been occasionally reproduced in modern times.» In brief, any single anatomical specimen, simply because it is isolated, may not be considered typical of the *Urmensch,* nor as evidence of his antiquity, nor as belonging to *Pithecanthropus erectus,* inasmuch as the isolated specimen may be abnormal and freakish. Actually misleading are such «fossil» finds as the various anthropolites or petrified men, for the anthropolite is not a true fossil but merely a quasi-petrifaction due to the action of calcareous waters, in short, is due to chemical and not to geological action. Had such remains been real fossils they would have put the appearance of man upon the earth much farther back than it can be put. The information to be gathered from utensils found together with human remains and from adjacent remains of wild beasts is valuable. Tools and hunting weapons, bones of tropical fauna and remains of man are found in the gravel beds of western Europe; it apparently follows that man antedates the Glacial period, inasmuch as this tropical fauna there was previous to the Ice Age, and since remains of Glacial fauna together with human remains occur in later (and superior) geological deposits. Thus the question of the antiquity of man becomes the simpler question of the date of the Ice Age. The answer is, 60,000 years ago at least. It is largely on the discovery of flint implements styled «chelléans» at Chelles in France that man is thus dated back to the semitropical epoch of the Pleistocene period.

The implements of prehistoric man, as ordinarily classified by material, form the basis of a division of early industrial development into the Stone Age, the Bronze Age, and the Iron Age. The use of animal sinews, bones, etc., apparently antedates the period of stone implements; hence the more elaborate classification into Zoomimic, Protolithic, Technolithic, and Metallurgic, for which see Anthropology, American.

As industrial arts began in imitation of the animals, so it is possible that the worship of man began with his wonder at the beasts, and with his personifying them, and secondly all natural forces. Animism or spirit worship was probably a second stage, although Herbert Spencer makes its sub-species ancestor-worship, which is still a live force in China, the source of all religious cults, tracing back to it totemism, as a sort of ghost-worship, and naturism, hinting that the spirits of the departed were supposed to take up their dwelling in trees and rocks. Magic is closely related in primitive cultus both with naturism and animism. (See Religion.) (See also Anthropology, American; Anthropology; Ethnology; Anthropomery.) Consult: Keane, 'Man, Past and Present' (1899); Girard, 'Aide-mémoire d'Anthropologie et d'Ethnographie'; 'The American Anthropologist'; Mivart, 'Man and Apes' (1873); Quételet, 'Physique Sociale' (1869).

Man and Nature, a work of great research written in 1864 by George Perkins Marsh (q.v.). Its full title was 'Man and Nature, or Physical Geography as Modified by Human Action.' The work became at once a standard with international recognition; a considerably enlarged Italian edition was issued at Florence in 1870; and a second American edition, with further changes, appeared in 1874.

Man-eater, a term applied to any fierce animal which has acquired, or is believed to have acquired, a habit of killing human beings as food. Lions, tigers, leopards and other great cats are accused of it, and undoubtedly many of these beasts, finding how easily a man or woman among East Indian or African villagers may be struck down or seized when sleeping in a flimsy hut, make their lairs near settlements and for a time regularly subsist upon human victims. Such are sometimes, but not always, old cattle-thieves, whose teeth are worn, and which feel unable or unwilling to undertake the exertion of tracking and pulling down wild animals; but this is not always the case. When such a beast has taken his residence in a district no pains must be spared to kill him, for he will not cease his depredations. Horses, elephants, camels, etc., sometimes become man-eaters in effect, understanding and exercising their power over him for harm.

A man-eater shark is the great white or blue shark (*Carcharodon carcharias*), which is one of the largest and most formidable of fishes. See Shark.

Man-of-the-Earth, a local name in the Southern States for the wild potato-vine (*Ipomœa pandurata*), which «over the dry soil of fields . . . spreads in summer many of its great, white, waxy flowers, effectively spotted at their bases with purple.» See Ipomæa; Morning-glory.

Man in the Iron Mask, The. See Iron Mask, the Man in.

Man, Isle of. See Isle of Man.

Man-of-war, an armed naval vessel regularly employed in the service of a government for war purposes. See Navy of the United States.

Man-of-war Hawk, or **Frigate-bird,** a tropical web-footed bird (*Fregata aquila*), of the family *Pelecanidæ*. The color of the adult bird is shining black, glossed with green, the female being duller in hue. Including the long tail the male bird reaches 3 feet in length, but the body is extremely small. The bill is longer than the head, strong, hooked at the point, and sharp. In proportion to their size their wings are longer than in any other bird, and have an extent of 7 feet or more. Their flight is so powerful that they are seen more than a thousand miles from shore. They move with great difficulty on land, and rarely alight on the water. Possessing great strength and superior power of wing, the frigate-bird pursues terns or gulls which have secured a fish, and by beating them with wings and beak forces them to drop or disgorge it; then seizes the prey before it reaches the water. It also catches flying-fish for itself. Its usual locality for breeding is the summit of some rocky cliff, but breeds among trees where there are no rocky shores, making a rough platform of sticks. There is only one chalky white egg. This species is found throughout the tropics, and a second species (*F. minor*) ranges about the Indian and South Pacific Oceans.

Man-yoshu, män-yō-shoo', or **Manyōshiu** (Japanese, COLLECTION OF ONE THOUSAND LEAVES), Japanese anthology, the most ancient in the language. It is believed to have been completed early in the 9th century; it comprises about 4,000 poems which form a valuable index to the history, customs, and literary attainments of the time. Among its hundreds of authors the most able are Hitomaro and Akahito. The poems form a record of about 130 years, covering the latter part of the 7th and the early part of the 8th centuries.

Man'acle Rocks, England, a dangerous reef on the south coast of Cornwall, not far from Lizard Head and near the town of Falmouth. They are barely visible, except at low water, and there is no warning of their presence to the mariner except a bell buoy. Many wrecks have occurred here.

Managua, mä-nä'gwä, Nicaragua, (1) the capital of the state, near the southwest shore of Lake Managua, 32 miles south-southwest of Leon, consists of long rows of huts, and a large square lined with houses of two stories. The centre of the square is occupied by a large church, and there is another large church with a conspicuous white arched portal. The inhabitants, chiefly Indians, are industrious. A railway connects Managua with Corinto on the Pacific. Pop. about 30,000; (2) the lake, about 38 miles long, discharges itself into that of Nicaraugua, above which it has an elevation of 16 feet, while its elevation above the Pacific is 156 feet. It has attracted a good deal of attention in connection with a proposed navigable communication between the Atlantic and Pacific.

Man'akins, a rather undefined group of South American tropical birds, mostly of the family *Pipradæ*, related to the North American tyrant-flycatchers. They are small, brightly colored (but the females are usually much plainer than the males), and the wings often bear curiously modified and often highly ornamental feathers. They are of terrestrial habits, staying upon or near the ground in wooded places, clinging to herbs and twigs of bushes like chickadees, and subsisting upon insects largely caught on the wing. Some of the species, called «dansadors» in Brazil, gather in little parties in the breeding season, and go through queer active motions, called dancing. Consult: Evans, 'Birds' (1900).

Manaoag, mä-nä'wăg, Philippines, a pueblo of the province of Pangasinán, Luzon, situated on the Malabolo River, 18 miles east of Lingayén, an important road centre. Pop. 17,500.

Manaos, mä-nä'oos, Brazil, city and capital of the state of Amazonas, on the Rio Negro, 12 miles above its confluence with the Amazon. A whitewashed cathedral rises in the centre of the town, which also has a custom house, a small fort, and a military barracks and hospital. The city is a steamboat station, and has a considerable trade in various forest products, but principally in india-rubber. Pop. about 20,000.

Manar, mä-när', or **Manaar, Gulf of,** southern India, an ocean inlet between Ceylon and the Madras coast with an extreme width of nearly 200 miles. It is almost closed at Palk Strait on the north by Adam's Bridge, a low reef of rocks and islands. The gulf has celebrated pearl fisheries.

Manasarowar, mă-nă-sä-rō-wär', Tibet, a sacred lake and pilgrimage resort north of the main Himalayan range, near Darchan, between the sources of the Brahmaputra and the Indus. It is almost circular in form, about 15 miles in diameter, and is drained by the Sutlej.

Manassas, mạ-năs'ạs, Va., town, in Prince William County; near a creek named Bull Run, and at the place where the Manassas Gap and Alexandria railroads meet. It is about 35 miles southwest of Washington. Twice during the Civil War Manassas was the scene of engagements. See BULL RUN, BATTLE OF.

Manassas, First and Second Battles of. See BULL RUN.

Manassas Gap, Engagement of. Gen Lee, in retreating from Gettysburg, crossed the Potomac at Williamsport, into the Shenandoah Valley, and 15 July 1863 marched to Bunker Hill, and occupied the gaps of the Blue Ridge. On 19 July he ordered Longstreet to march next morning to Culpeper Court House, by way of Front Royal and Chester Gap. Gen. Meade crossed the Potomac at Harper's Ferry and Berlin, on the 17th and 18th, and moved up the Loudoun Valley along the eastern side of the Blue Ridge; and on the 21st Merritt's brigade of Buford's cavalry division, pushing well up into Manassas Gap, skirmished with the 17th Virginia infantry, and took 20 prisoners, from whom it was ascertained that Lee was moving up the valley with the evident intention of passing to the east of the Blue Ridge. Meade ordered the Third, Fifth, and Second corps to march upon Manassas Gap, directing Gen. French, commanding the Third corps, then guarding Ashby's Gap, to hasten to Buford's support. Before dark of the 22d French reached Piedmont, and Birney's division was pushed forward to Buford's aid, followed by the remainder of the corps, and at daylight of the 23d entered the Gap and relieved Merritt's cavalry, which moved up to Chester's Gap. Meanwhile, at dawn of the 23d, Hood's division of Longstreet's corps had marched from Front Royal and, relieving the 17th Virginia, was deployed in the Gap, where it was relieved during the morning by Wright's brigade of about 600 men of R. H. Anderson's division, under orders to hold the Gap until relieved by Ewell, then marching from Winchester. Wright's brigade was deployed at the west end of the Gap, and Rodes' division, with two batteries of artillery, coming to its support, drew up about 600 yards in rear, and sent 250 sharpshooters to take position on its left. These dispositions were completed about 2 P.M. Meanwhile Birney's division had advanced, steadily driving in the Confederate outposts and from Wapping Heights beyond which was Wright's line. About 4 P.M. Spinola's Excelsior brigade and two regiments of Ward's went forward at a charge and, sweeping past Wapping Heights, engaged Wright's men in a close and severe fight, driving them back upon Rodes, who stood firm, the artillery checking the Union advance about dark, Rodes' line not being engaged, and losing but 15 killed and wounded. Wright's loss was 19 killed, 83 wounded, and 66 missing. French's loss was 21 killed and 84 wounded. Ewell fell back to Front Royal during the night. Next morning the Union advance marched to Front Royal, but all of Lee's army had passed and, marching swiftly through Chester and Thornston's gaps, it took position on the south side of the Rappahannock. Consult: 'Official Records,' Vol. XXVII.; Humphreys, 'From Gettysburg to the Rapidan.'

E. A. CARMAN.

Manasseh, the name of several scriptural personages: (1) eldest son of Joseph: b. Egypt. When brought with Ephraim to receive the blessing of his grandfather Jacob, the old man placed his right hand upon the head of the younger, and his left upon that of Manasseh, thus depriving the latter of the precedence due to his priority of birth. The descendants of Manasseh formed a tribe, which, in Canaan, was settled half beyond the Jordan, and half on the west side. (2) A king of Judah, who was made tributary to Esarhaddon, carried captive to Babylon, but restored upon his repentance. (3) A priest who in the time of the prophet Malachi built a rival temple on Mount Gerizim.

Manatee', an aquatic mammal or «sea-cow» of the order *Sirenia* (q.v., for general structure), several species of which inhabit the fresh waters along the eastern coasts of tropical America, and of western Africa. The body is somewhat seal-like in shape, reaches a length of eight or ten feet, has a large round head with bristly, tumid lips, no apparent neck, no external ears, the forelimbs converted into paddles, no hind limbs, and the tail spade-shaped, like that of a beaver. The thick wrinkled skin is blackish, and almost hairless, but a coat of short, seal-like fur clothes the fœtus, indicating descent from furry ancestors. Structurally the manatee differs from other sirenians in having only six cervical vertebræ, and in the large number of molar teeth, which apparently go on increasing indefinitely during the animal's life, — the suggestion being, as Bedard points out, that they are worn away by the attrition resulting from so much sand being mixed with the daily food. The cleft lip to be mentioned hereafter, is also a generic peculiarity. The manatees are stupid, gentle, defenseless and harmless creatures, showing great affection for their young, one or two in number, which are nursed at pectoral udders, often while the mother stands erect upon her tail enfolding the «calves» with her broad arms. They never come ashore, but secrete themselves amid aquatic vegetation, where the only enemies they need fear are the larger alligators, and the jaguar. Their food consists of fresh-water weeds and their roots, and these are procured by means of the curious form of the upper lip: «this is split in two, and the two halves, which are furnished with strong bristles, can play upon each other like the points of a pair of forceps.» This cleft-lip is only suggested in the case of the dugong, but the fœtus of that animal shows the structure plainly, indicating that the manatee is the more primitive form of the two. The flesh is excellent for food. The American manatees have been nearly exterminated. They formerly abounded in the Indian River and other marshy waters about southern Florida, but by the end of the 19th century had been reduced to a small carefully protected band near Biscayne Bay. They still survive in small numbers along the coast of the Carribean Sea and about the mouths of the Orinoco. The Florida manatee is called by American zoologists *M. latirostris*, and is regarded as different from those of Central and South America, long known as *M. americanus*. The African species is *M. senegalensis*.

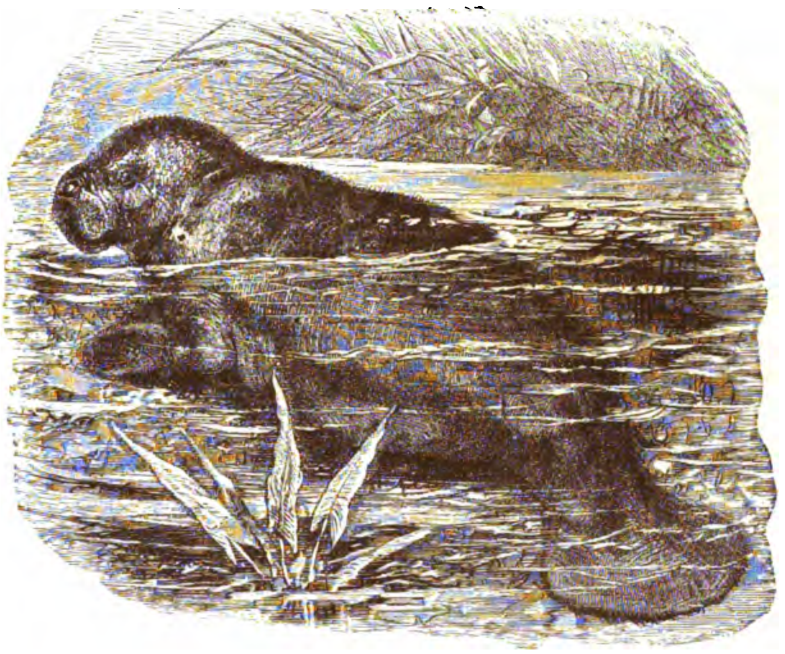
Consult: Beddard, 'Mammals' (1901); Alston, 'Biologia Centrali-Americana' (1875); 'Standard Natural History,' Vol. V. (1885).

Manatt, James Irving, American educator: b. Millersburg, Ohio, 17 Feb. 1845. He was graduated from Iowa College in 1869, having previously served for a time in the Federal army. He engaged in journalism, but soon abandoned it to continue his studies and in 1877–84 was professor of Greek at Marietta College; in 1884–9 he was chancellor of the University of Nebraska and since 1893 has occupied the chair of Greek literature and history at Brown University. With Tsountas he has published 'The Mycenæan Age' (1895).

Manayunk, măn-ạ-yŭnk'. See PHILADELPHIA.

Man'by, George William, English inventor: b. Hilgay, Norfolk, 28 Nov. 1765; d. Southtown, Great Yarmouth, 18 Nov. 1854. He was educated at the military college of Woolwich, and became in 1803 barrack master at Great Yarmouth. His attention having been drawn to calamities resulting in cases of shipwreck, from the difficulty of establishing communication with the shore, he attempted casting a rope from the shore to the wreck by the agency of gunpowder. Chains were unable to stand the shock of the discharge, but stout strips of rawhide closely platted together were found to answer; and on 12 Feb. 1808, the entire crew of the brig Elizabeth, wrecked within 150 yards of the beach, were rescued by the simple contrivance of Capt. Manby. In 1810 his invention was brought before a committee of the House of Commons, and having been favorably reported on, he received a grant of money, and all the dangerous stations on the British coasts were supplied with his apparatus. He also contrived shells filled with luminous matter, to enable the crew to perceive the approach of the rope, in the manufacture of which he suggested several improvements. He published the 'History and Antiquities of the Parish of St. David, South Wales' (1801); 'The Preservation of Shipwrecked Persons' (1812); 'Journal of a Voyage to Greenland in 1821' (1822); and a number of writings relative to shipwrecks and to his various inventions.

Mance, Jeanne, zhän mäṅs, French philanthropist: b. Nogent-le-Roi, France, 1606; d. Canada 1673. She was a religious enthusiast



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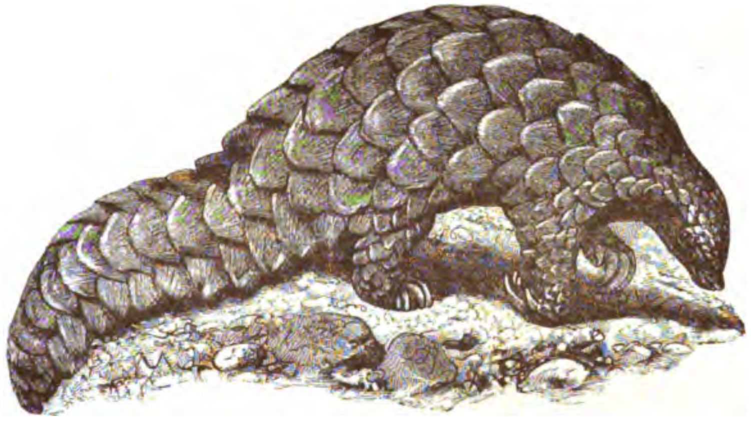

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1. West Indian Manatee 2. Short-tailed Indian Manis.

and was one of the party conducted by Maisonneuve (q.v.) to Canada in 1641, and was an able assistant to him in the religious enterprises established in Canada. She was an indefatigable worker, had charge of the hospital at Montreal and exercised much influence in the government of the colony. She made several visits to France to obtain the funds necessary in the work and died head of the Sisters of Saint Joseph.

Man'chester, Conn., town, in Hartford County; on the Hockanum River, and on the New York, N. H. & H. railroad (formerly New England railroad); about eight miles east of Hartford. Until 1823, when it was incorporated as Manchester, it formed a part of East Hartford; it includes the villages of Highland Park, Buckland, Manchester, Manchester Green, and South Manchester. The town has extensive manufacturing plants, the most important being the Cheney Silk Mills. It has also cotton and woolen mills, paper mills, needle works, and electrical supply works. A large amount of tinware is made in Manchester. There are two public libraries, one in the village of Manchester, and one in South Manchester. Pop. (1910) 13,641.

Manchester, England, an episcopal and university city, inland port, and parliamentary and county borough of Lancashire, 188 miles north of London, and 31 miles east of Liverpool, on the Irwell, an affluent of the Mersey, since 1894 connected with the sea at Eastham on the Mersey, by the Manchester Ship-Canal (q. v.) 35½ miles long. It is one of the principal manufacturing cities of the world and the cotton trade centre of Great Britain. It covers over 19,800 acres. Railways and electric street tramways communicate with the surrounding towns and villages of the most populous industrial region of England.

Geology.—Manchester is built on a large plain, within easy distance of breezy hills and moorland, which are clearly visible from the outskirts of the city. The surface of the ground is composed of thick deposits of glacial drift—boulder clay, sands and gravels—beneath which are Triassic, Permian, and Carboniferous rocks. Rich coal-fields are found in the neighboring parts, some of which extend under a portion of the city.

Industries and Finances.—Though Manchester is the chief seat of the cotton trade, it is no longer that of its manufacture, much of that industry being carried on in towns and villages beyond its borders. A considerable number, however, remain of cotton mills, print works, dyeing and bleaching concerns, and factories concerned with other branches of textile manufacture. Engineering and machinery works are exceedingly numerous, as are the manufactories of electrical appliances. It is calculated that there are about 700 different industries carried on here, some of the chief among them, apart from those named above, being chemical, india rubber, paper and glass works. The membership of the Royal exchange is over 7,000, and the Grocery exchange about 3,000. There are also stock, corn, provision, coal and cotton-waste exchanges. The vegetable and fruit market serves for the whole of South Lancashire and part of Cheshire, while the fish market is second only to Billingsgate. There are nearly a score of banks, with numerous branches, and the amount of money 'cleared' during the year 1905 was £263,586,003. The business of the Post Office exceeds that of any other out of London.

Bridges and Railway Terminals.—The bridges are of no engineering importance, as the Irwell is here but a narrow river. The terminal railway stations are six in number. (1) London Road, 1842, rebuilt 1881; (2) Victoria, 1844, since greatly enlarged; (3) Oxford Road; (4) Central, 1877, near which the Midland Railway Company have erected a great hotel; (5) Exchange, 1884; (6) Deansgate, 1898, for the goods traffic of the Great Northern Railway. The oldest railway station in the world is still to be seen in Liverpool Road, though not used for its original purpose. It was opened in 1830.

Buildings.—The principal public building is the town hall, commenced in 1868 and completed in 1877, at a cost, including land, of upwards of a million pounds. It covers an area of 8,648 square yards. The clock-tower is 286 feet high and contains a peal of 21 bells. In the great hall is a series of frescoes by Ford Madox Brown, illustrating incidents in the history of Manchester. The old town hall, erected in 1825, is now occupied as the Free Reference Library. It is a classical building, and another of the same style and period is the City Art Gallery, formerly known as the Royal Institution. The Royal Infirmary, which originated in 1752, is situated in one of the finest positions in the centre of the community, but is about to be removed to an exclusive new building on a site on the outskirts, the old site having been purchased by the corporation for £400,000. The Free Trade Hall (1856), built in the Italian style, will hold 5,000 people and has been the scene of many great political meetings and of the renowned concerts conducted by Sir Charles Hallé and Dr. Hans Richter. In a similar style is the Royal Exchange (1868-74), one of the most spacious erections of its kind. The area of the great hall is 5,170 square yards. The Assize Courts by Alfred Waterhouse, the architect of the Town Hall, were built in 1864, at a cost of £100,000. Immediately to their rear is the county jail. The University buildings are also by Waterhouse. The John Rylands Library, by Basil Champneys, is perhaps the chief architectural gem of the city. Other examples of street architecture worthy of attention are the City Police Courts, the Corn Exchange, the Inland Revenue Offices, the Post-office, new Fire Brigade Station, Reform and Conservative Clubs, and many of the banks, insurance offices and warehouses. The Municipal School of Technology is one of the most striking examples anywhere of a well-equipped school in an imposing building.

Educational Institutions.—Manchester University (q. v.) was reconstructed as an independent corporation in 1903. It was originally founded as the Victoria University in 1880, with a federation of the Owens College, Manchester, and the University College, Liverpool, as its colleges, to which the Yorkshire College at Leeds was afterwards added; but in 1903 a separate university charter was granted to each city. The Owen College, which has now been incorporated with the university, was founded in 1850 by the aid of nearly £100,000 left by Mr. John Owens. It began work in a large house formerly occupied by Richard Cobden and was removed to the present fine buildings in 1873. Since then the Museum, Christie library, medical school, physiological and other laboratories, and the Whitworth Hall, have been added and the institution has benefited from many large gifts and bequests. There are 46 professors and about 130 lecturers. The splendid Municipal School of Technology is affiliated to the university and the subjects in the faculty of technology are taken there. The faculty of theology was instituted in 1904, and the co-operation of the various theological colleges was obtained. These include Baptist, Free-Methodist, Independent, Primitive Methodist, Roman Catholic, Unitarian, and Wesleyan colleges. The oldest educational institution in the city is the Grammar School, founded by Bishop Hugh Oldham in 1515. It has now about 900 scholars. Many distinguished names appear in the records of its alumni. Chetham's Hospital is named below. The following may be added: The Girls' High School, the Hulme Grammar School (founded by the Hulmean trustees), the Nicholls Hospital, Warehousemen and Clerks' School, and the Royal Manchester College of Music, founded in 1893, as well as the numerous elementary and other schools.

Libraries.—Of libraries, the most recent, the John Rylands Library, is the most widely known, on account of its marvellous collection of rare and costly books and manuscripts. Its hundred thousand volumes embrace the Althorp Library, purchased from Earl Spencer, and Lord Crawford's collection of manuscripts. It was founded and endowed by Mrs. Rylands in memory of her husband and was opened in 1899. The Chetham Library dates from 1656, from which time it has been open free to all, and is part of the foundation of Humphrey Chetham, the other part being a hospital or school for poor children. The Public Free Libraries were established in 1852 and are supported by a public rate, which now yields nearly £30,000 a year. The chief or reference library contains 160,000 volumes and the 19 branch or lending libraries some 215,000 volumes. The Christie Library at the University was built by the late Mr. R. C. Christie, and on its shelves are the entire libraries of Mr. Christie himself, of Bishop Prince Lee, Professor E. A. Freeman, in addition to other special and general collections. The Medical and Law Libraries belong to the members of those professions, and there are other public and semi-public libraries of importance.

Art Galleries.—The City Art Gallery has been maintained by the corporation since 1882 and contains many fine examples of the British School, particularly works of Millais, Leighton, Holman Hunt, G. F. Watts and other modern artists. In this gallery, which formerly belonged to the Royal Institution, annual exhibitions have been held since 1827. The Manchester Academy of Fine Arts also holds its exhibitions here. Attached to the Municipal School of Art is a well arranged art museum, and in the Whitworth Institute galleries in Whitworth Park, will be found a rich collection of pictures, including a nearly complete series of specimens of the best English water colors, from those of Sandby, Girtin and Turner onwards. The Institute is one of many benefactions enjoyed by Manchester from money left by Sir Joseph Whitworth.

Churches.—When the diocese of Manchester was founded in 1847 the Collegiate Church became the Cathedral. It is of unknown origin, but the present perpendicular Gothic building was raised, on an earlier foundation, about 1422. A large part has been rebuilt, mainly on the old lines, in recent years, yet many interesting portions of the earlier building remain. The ancient stalls in their choir have exquisitely carved canopies. The ancient parish consisted of 29 townships, including Salford, and some of them had chapels of their own. In 1850 the ancient parish was divided into independent parishes by Act of Parliament. Next to the Cathedral the oldest church is Saint Ann's (1712), which contains some beautiful windows by F. G. Shields. Many of the 19th century churches are of considerable pretensions. Besides 91 belonging to the Church of England there are 28 Roman Catholic churches and many others belonging to various sects. The Jews have 11 synagogues; and there is a Greek and an Armenian church.

Hospitals.—Hospitals to the number of 16, all maintained by voluntary subscription, are provided for the treatment of nearly every complaint to which the human frame is liable. The Royal Infirmary is the chief one. Saint Mary's Hospital and the Eye Hospital are others of large dimensions, while to the Hospital for Consumption is attached a Sanatorium at Delamere in Cheshire, which was provided at a cost of £70,000 by a local benefactor (W. J. Crossley). In addition there are several dispensaries and asylums, and a large number of charitable institutions of various kinds.

Societies.—The literary and scientific societies are many in number and of high standing. The Chetham Society and the Record Society devote themselves to the publication of historical records of Lancashire and Cheshire. The Antiquarian Society (1883) has similar objects. The Literary and Philosophical Society was founded in 1781, the Literary Club in 1862, the Statistical Society in 1833, the Geological Society in 1839, the Geographical Society in 1884. These, as well as the Microscopical, and some other societies, all publish their transactions. Musical societies are numerous and vigorous, and the artists, architects, lawyers, doctors, accountants, and men of other callings, have their own societies.

Public Works, Parks, Etc.—The corporation is the owner of the waterworks that supply Manchester and Salford and some surrounding towns and villages. The water comes from Longdendale on the borders of Derbyshire, and Thirlmere in Cumberland, and the works have cost over £8,000,000. The average quantity of water supplied per day is 33,000,000 gallons. The gas works have been the property of the Corporation since the incorporation of the borough, and have always yielded a profit in aid of the rates. The supply of electricity is also a municipal undertaking. So also the fire brigade, public abottoirs, the foreign animal wharf on the ship canal, cold-air stores, and the extensive sanitary works. The markets and the electric tramways are under municipal ownership. The city has 11 public parks and many open spaces and playgrounds. The area of the largest (Heaton Park) is 662 acres and its cost was £220,000. The other municipal works include baths, cemeteries, workmen's dwellings, infectious diseases hospitals, libraries, art galleries, technical school, and school of arts. The council are also the local education authority for the city. The construction of the ship canal involved an outlay of £15,000,000, one-third of which was lent by the Corporation, who appoint 11 out of the 21 directors of the Ship Canal Company.

Government.—Since 1838 Manchester has been governed under the Municipal Corporations Acts and a long series of local statutes. The council consists of 124 members, 31 of whom are aldermen. The head of the council is styled Lord Mayor, that title being conferred in 1893. For the administration of the affairs of the municipality, the council divides itself into 19 standing committees and several special committees. The administration of the poor law is entrusted to three boards of guardians, for the central and the North and South townships, and there are separate workhouses and other necessary establishments. There is a court of record for the trial of civil actions, established in 1838 and re-constituted in 1858, and now amalgamated with the court of record of the Hundred of Salford; and since 1839 there has been a separate commission of the peace, and separate quarter sessions. The assize, county, chancery, and other law courts held in the city are not under local control.

History.—Manchester was in prehistoric times occupied by the Britons, as proved by urns and implements that have been unearthed, and abundant Roman relics bear evidence to a long period of Roman occupation. Little is known of the rule of the English or Saxons, but among other traditions is that of Queen Ethelbega, wife of Ina, King of Wessex, having lived here in 689, and of the Danes sacking the town in 863. In 923 King Edward the Elder, son of Alfred the Great, rebuilt and fortified Manchester. Manchester is mentioned in the Domesday Book, 1086, as possessing two churches, one of which is now conjectured to have been at Ashton-under Lyne, originally in the parish. The barony of Manchester was held by the Gresleys, 1086 to 1313, and the last of that family granted a charter to his burgesses in 1301, and it was by this charter that the town was governed for over five centuries. The manor was afterwards held by the De la Warres and the Wests until 1579 when it was sold to John Lacye, a London Mercer, for £3,000, who in turn disposed of it in 1596 for a profit of £500 to Sir Nicholas Mosley, a Manchester man, who had become a prosperous London merchant, destined to fill the office of Lord Mayor three years after his purchase of the manor. In his family the manor remained until 1845, when the whole of the manorial rights were purchased by the corporation for £200,000. One of the lords of Manchester, Thomas la Warre, entered the priesthood, became rector of the parish, and in 1421 provided the means for collegiating the church, and gave his manor house as a residence for the clergy of the college. This house, now known as Chetham's Hospital, is, apart from the church, almost the sole architectural relic of feudal Manchester. After the Reformation the building was confiscated by the Crown, and in the reign of Edward VI. passed by purchase to the Earl of Derby. In his family it remained until the Commonwealth, when it was sequestered by the Parliament, with other possessions of the royalist Earl of Derby. In 1656 it was purchased by the executors of Humphrey Chetham and turned to its present uses. Manchester was visited in 1495 by Henry VII. It is unknown when the town began to be established as a trading and manufacturing centre, but it is clear from an Act of 1541, that a considerable commercial position had by that time been attained. Manchester holds an important position in the earlier history of the civil wars. At the outset the townsmen took the side of the Parliament, and made an effort to avert the conflict by presenting a petition to King Charles. The town was besieged by Lord Strange, who was repulsed. Prior to the actual siege, he demanded the delivery of the magazine, and in an affray which ensued a man was killed. This was on 15 July 1642, and the fatality was one of the first that occurred in the wars. The town was represented in Cromwell's first and second parliaments. In 1715 there were many Jacobites among the influential townsmen, and in the rising of 1745 the Young Pretender found numerous adherents here. Some of them, on the failure of the rebellion, were executed for their treason. The Duke of Bridgewater opened his canal from Worsley to Manchester in 1761, and the extension to Runcorn was completed in 1795. Distress, caused by the wars and high taxation, was a main cause of the political discontents which marked the first two decades of the 19th century, and are remembered by a weavers' riot in 1808, the "blanketeers" meetings in 1817, and the disastrous Peterloo affair of 1819, when, at a meeting to petition Parliament for the redress of grievances, several people were killed and many more injured during a charge of the military, after the reading of the riot act. The Manchester and Liverpool railway was opened in 1830, marking a new era in internal communication. Manchester was enfranchised by the Reform Act of 1832, getting two members. The Anti-Corn Law League was established in 1839, and prosecuted a vigorous campaign throughout the country, culminating in the repeal of the Corn Laws in 1846. In 1847 the bishopric of Manchester was created and the collegiate church converted into a cathedral. Queen Victoria paid three visits to Manchester, the first in 1851, the second in 1857, and the last in 1894, when she opened the Ship Canal. The great Art Treasures Exhibition in 1887 was held in 1857 and the Jubilee Exhibition in 1887. Both were remarkably successful, the latter yielding a profit of £43,300, which was devoted to public uses. From 1862 to 1865 there was great distress throughout the cotton manufacturing districts, owing to the American War, a relief fund of over a million of money was raised on behalf of the operatives. The Ship Canal was projected in 1882 and opened in 1894. In March 1902 the city was visited by the Prince and Princess of Wales, who came to open the Whitworth Hall at Owens College; in July 1905 King Edward VII. opened a new dock at the Ship Canal.

Population.— The population of Manchester (1910) is 615,000. In 1841 it was 242,983, in 1871, 351,189, and in 1891, 505,368. The great increase is partially accounted for by the extensions of the city boundaries which took place in 1885, 1890, and 1904.

Bibliography.— Ware, 'Foundations in Manchester' (4 vols. 1828); Axon, 'Annals of Manchester' (1886); Roeder, 'Roman Manchester' (1900); Tait, 'Mediæval Manchester' (1904); Harland, 'Mamecestre'; Hudson, 'Manchester Municipal Code' (6 vols.); 'Manchester Official Handbook,' published annually; 'Handbook and Guide to Manchester.' Edited by J. H. Ray (1902); Whitaker, 'History of Manchester' (London 1773); Bannerman & Sons, 'Mercantile Manchester, Past and Present' (Manchester 1896); Proctor, 'Memorials of Bygone Manchester with Glimpses of the Environs' (Manchester 1879); Darbyshire, 'A Booke of Olde Manchester and Salford' (Manchester 1887); Wheeler, 'Manchester' (London 1836).

Charles W. Sutton,
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Manchester, Iowa, city, county-seat of Delaware County; on the Maquoketa River, and on the Illinois Central railroad; about 130 miles northeast of Des Moines and 45 miles west of Dubuque. It is situated in an agricultural region, and its excellent water-power is utilized in manufacturing industries. The chief manufactures are woolen goods, tiles, brick, fencing, flour, wagons, carriages, and dairy products. Manchester is the trade centre of a large part of Delaware, and the adjoining counties, and ships farm produces, dairy products, and live-stock. A United States fish hatchery is in the vicinity. Pop. (1910) 2,758.

Manchester, Mass., town, in Essex County, on Massachusetts Bay; and on the Boston & Maine railroad; about five miles southwest of Gloucester. The first settlement was made in 1630, and until 1645 the place was called "Jefrey's Creek," when the name was changed to Manchester and the town was incorporated. Since 1845 Manchester has been a favorite summer resort, one of the attractions being a Singing Beach. In addition to good public schools the town has a free public library in the Coolidge Memorial. Pop. (1910) 2,673. Consult: Lamson, 'History of the Town of Manchester.'

Manchester, N. H., city, one of the county-seats of Hillsboro County; on the Merrimac River at the mouth of the Piscataquog, and on branches of the Boston & Maine railroad; about 17 miles south of Concord, the capital of the State, and 56 miles north of Boston. The first settlement was made in 1722, and for a number of years it was called Amoskeag and Harrytown. In 1751 it was incorporated as "Derryfield," and in 1810 the name was changed to Manchester. It was chartered as a city in 1846. The Amoskeag Falls (54 feet) in the Merrimac, above the city provides extensive water-power which by means of canals is made available for manufacturing. The city's prosperity is largely dependent upon this water-power, which for years has been controlled by the Amoskeag Manufacturing Company. The city has over 400 manufactories, representing about 60 different industries. The capital invested is about $25,000,000, and the number of employees about 16,000. The chief industrial establishments are the cotton mills, the Amoskeag, Amory, Manchester, and Stark mills alone have a capital invested of about $14,018,000, and their annual output is estimated at $11,000,000. Other manufactures are foundry and machine-shop products, (especially locomotives and fire-engines), hosiery, paper, boots and shoes, wooden-ware, needles, woolen goods, knit goods, leather, lumber, wagons, carriages, and furniture. The system of waterworks, owned by the city, has a reservoir of 16,000,000 gallons capacity which is fed from Lake Massabesic, a body of pure water about four miles from the city. The works were completed in 1874 at a cost of $600,000. Some of the principal public buildings are the Government building, the Roman Catholic Cathedral, the county court-house, Sacred Heart Hospital, Hospital of Our Lady of Lourdes, and a public library, which contains about 46,000 volumes. The several public parks are well kept and add much to the attractive features of the city. The city has the State Industrial School, Saint Joseph's and Saint Patrick's orphanages, and Saint Patrick's and Saint Vincent's Homes for the Aged. The educational institutions are a public high school, three parish high schools, a number of grammar and elementary public and parish schools, a training-school for teachers, Saint Augustine's and Saint Mary's academies, and Saint Anselm's College. There are five national banks with a combined capital of $750,000, and six savings banks, with a surplus of $855,500. Pop. (1910) 70,063.

Manchester, Vt., village, one of the county-seats of Bennington County; on the Battenkill River, and on the Bennington & Rutland railroad; about 32 miles south by west from Rutland. Manchester was one of the disputed places in the early days, when what is now Vermont was nearly all owned by New Hampshire, but a part by New York. In 1761 Manchester was incorporated as a town and as a village in 1900. It is situated in a beautiful locality near Mount Equinox, which is 3,816 feet above the sea. The village is in a fertile farming section, where dairy products are a chief source of income. An excellent quality of marble is found in the vicinity, and the forests furnish a considerable amount of timber for the lumber mills. The water from mineral springs nearby is shipped to many parts of the country. Fishing rods and ginger champagne are manufactured extensively. It is the seat of the Burr and Burton Seminary, and has the Skinner Memorial Library, which contains about 17,000 volumes. A large part of the sidewalk of the village is made of marble. Manchester is a favorite summer resort. Pop. (1910) 2,044.

Manchester, Va., city, in Chesterfield County; on the James River and on the Atlantic C. L., the Seaboard A. L., and the Southern R.R.'s. It is opposite Richmond, with which it is connected by several bridges. It is situated in an agricultural and coal region; and its industries are connected largely with the products of the farms and mines. At Manchester there is a fall in the James River of 100 feet in about six miles. The extensive water-power is used for manufacturing in both Richmond and Manchester. Its chief manufacturing establishments are foundries, cotton mills, flour mills, woodenware factories, brick yards, and the repair shops of the Southern railway. The city, with its population of nearly 10,000, was annexed to Richmond in 1906.

Manchester Canal, England, a great ship-canal, by which Manchester (q.v.), an inland town, was virtually converted into a seaport. The canal works were begun 11 Nov. 1887 and traffic was fully started in the beginning of 1894, the canal having been opened over a part of its length in 1891. The canal is 35½ miles long, the seaward end being at Eastham on the south side of the Mersey estuary, where three large locks have been constructed. There are locks on other portions of the canal, Manchester being situated 60 feet above sea-level. The minimum width of the canal at bottom is 120 feet, the maximum 170 feet; the minimum width at water-level is 172 feet, the maximum 230 feet; the minimum depth is 26 feet, on the lock sills it is 28 feet. From Manchester to Warrington the canal follows generally the course of the Irwell and the combined Irwell and Mersey, the river being deepened, widened, and straightened, where this was deemed advisable. In the lower part of its course the canal becomes semi-tidal, and from Runcorn onward it runs along the southern bank of the Mersey estuary, parallel with and near the river. At one point the Bridgewater Canal crosses the Manchester Canal, by a swinging caisson capable of being revolved while full of water to let a vessel through that has masts too high to pass under. The contract for constructing the canal was let at $26,750,000, but the company had to raise a sum of over $75,000,000 as capital. Of this sum Manchester contributed $25,000,000, stipulating for unconditional control by a majority of the directorate. The total amount of excavation in the canal and docks was about 45,000,000 cubic yards, one-fourth being sandstone rock.

Manchester University. This University, officially styled the Victoria University of Manchester, has grown out of the Owens College, which was founded under the will of John Owens, a Manchester merchant who died in 1846, leaving £96,654 for the foundation of a college which should be free from religious tests. It was opened on 12 March 1851 in a house in Quay street, formerly the residence of Richard Cobden, with a staff of five professors and two teachers. It was originally governed by trustees under the founder's will, but by Acts of Parliament, passed in 1870 and 1871, a new governing body was formed. The first principal was Mr. A. J. Scott, who resigned in 1857, and was followed by Dr. J. G. Greenwood, who held the office for 32 years. In 1889 Dr. A. W. Ward was appointed, and at the end of 1897 he was succeeded by Dr. Alfred Hopkinson.

About 1870 a movement was started to provide a new site and buildings for the college, and a fund of about £100.000 was raised. The new college in Oxford Road, built from the designs of Mr. Alfred Waterhouse, was opened in 1873. Many subsequent additions have been made, including the Medical School, the Beyer Laboratories (natural history), the Museum, the Whitworth Engineering Laboratory, the Schorlemmer Laboratory (organic chemistry), the Christie Library, the Physical Laboratory, the Schunck Chemical Laboratory, the Whitworth Hall, and the Bacteriological Laboratory in connection with the department of Public Health.

In 1872 the Manchester Royal School of Medicine was amalgamated with the College, and has become a most important department, being now one of the greatest medical schools in the country.

The library contains 100.000 volumes, and includes the entire collections of Dr. R. C. Christie, Dr. E. A. Freeman, Professor Milnes Marshall, and other eminent scholars. The library building was erected by the munificence of Dr. Christie, who had been Professor of History in the college.

The Museum building was erected in 1884-5. It originated in the gift of the collections of the Manchester Natural History Society and the Manchester Geological Society, together with the proceeds of the sale of their museum building. Under the direction of Dr. W. E. Hoyle, the curator, it has become one of the completest and best arranged natural history museums in Great Britain. It is open free to the public, and its management is vested in a committee of representatives of the City Council and of the subscribers as well as of the university.

There are four halls of residence, two for men and two for women, for the benefit of students living at a distance from Manchester.

By the generosity of benefactors the students are provided with a gymnasium and a spacious athletic ground. A striking instance of the popularity of the college was shown in 1902, when its jubilee was commemorated, by the raising of a fund of £102,500, out of which the debts of the college were paid and the general endowment increased.

The idea of elevating the college to the rank of a university was first broached in 1875 by Professors Greenwood, Morgan, Roscoe, and Ward, but when memorials for a charter were in 1877 presented to the Privy Council, opposition was made by the Yorkshire College, Leeds, and by other bodies in order to prevent a university charter being conferred on Owens College alone. It was finally agreed that the new university should bear the title of the Victoria University, and that while Owens College should be the first college of the university, yet provision should be made for the admission from time to time of other colleges. The Royal Charter creating the university was granted on 20 April 1880. University College, Liverpool, was admitted as the second college on 5 Nov. 1884, and the Yorkshire College as the third college on 3 Oct. 1887. It provided that the university should have its seat in Manchester, and that the meetings of the University Court and Council and of the Convocation should be held in that city. A subsequent charter, dated 20 March 1883, gave power to confer degrees in medicine and surgery.

A movement began in 1902 in Liverpool for the foundation of a separate university for that city, and thereupon the Owens College presented a petition for the reconstruction of the Victoria University as an independent university for Manchester. Both petitions met with favor by the Privy Council and the new charter of the Victoria University of Manchester was granted on 15 July 1903, and on 24 June 1904, an Act for the incorporation of the Owens College with the university received the Royal Assent. Leeds obtained its own university charter on 25 April 1904.

Under the present constitution the authorities of the university are (1) the Chancellor; (2) the Vice-Chancellor; (3) two Pro-Vice-Chancellors; (4) the Court of Governors, which consists of 96 members; (5) the Council, which is an executive body and consists of 20 members, including four representatives of the Senate; (6) the Senate, 43 members; (7) the Board of Faculties; (8) Convocation, which now consists of 958 members.

The following are the various Faculties: Arts (degrees B.A., M.A., Litt.D.); Science, with a special department of education (degrees B.Sc., M.Sc., D.Sc.); Law (degrees LL.B. and LL.D.); Music (degrees Mus.B. and Mus.D.); Commerce (degrees B.Com. and M.Com.); Theology (degrees B.D. and D.D.); Technology (degrees B.Sc.Tech. and M.Sc.Tech.); Medicine (degrees M.B., Ch.B. (*i.e.* Bachelor of Surgery), M.D. and Ch.M.). In the Dental Department there are degrees of B.D.S. and M.D.S., and in the Department of Public Health diplomas are granted (D.P.H.) as well as D.V.S.M., *i.e.* Diploma in Veterinary State Medicine.

The teaching staff consists of 43 professors and about 160 lecturers and assistant lecturers, in addition to assistants in the Municipal School of Technology, where most of the technological subjects are taught.

The capital of the university amounts to about £1,060,000, including £416,000 value of buildings, etc., and the annual income to over £60,000, derived from endowments, government grants, grants from the city of Manchester and other municipal bodies, and from fees.

C. W. Sutton,
Chief Librarian, Manchester Public Library.

Manchuria, măn-choo'ri-ạ, China, comprises the northeasternmost portion of the empire, called by the Chinese Tung San Shêng, 'Three Eastern Provinces,' from its administrative divisions, Hilung Kiang, the northern province; Kirin, the central province, and Sheng-King, the southern province. It lies mainly between lat. 40° and 53° N. and lon. 118° and 135° E., and is separated from Asiatic Russia on the north and northeast by the Amur, on the east by the Usuri, and on the northwest by the Argun. On the west it is bounded by Mongolia and China proper, part of the boundary being the Palisade Barrier, separating it from the province of Pe-chi-li; on the south the boundaries are the Liao-tung Gulf, the Strait of Pe-chi-li, Korea Bay, the Yalu River, and Korea. The estimated area is 363,610 square miles. Vast chains of mountains ramify all over the country, one of them forming the south limits of the valley of the Amur. The principal rivers are the Amur; the Argun; the Sungari, the vast basin of which occupies a great part of the territory; the Usuri, like the Sungari, a tributary of the Amur; and the Liao-ho, flowing south into the Gulf of Liao-tung. The Nonni is an important southward-flowing tributary of the Sungari, and the Hurka or Khurkha joins the same river from the south. The climate is in most parts healthful and invigorating. In the northern and more elevated parts the cold of winter is intense, the thermometer sometimes falling to 48° below zero, and the snow lying for six months in the year. The summer temperature reaches about 90° in the shade.

The vast forests of the north are rich in useful timber of all kinds, such as walnut and oak, together with the soft pine and fir. They abound in wild animals, the tiger, panther, bear, wolf, and stag, as well as the eagle and other birds of prey. The rivers abound with fish. The soil is exceedingly fertile, especially in the valleys of the Liao and Nonni rivers. In the summer the southern part looks to an American much like Illinois, and one may find on its most northern hills lilies-of-the-valley, pink peonies, white and yellow daisies and the fragile dog roses, as in Wisconsin and Minnesota. With the exception of four ice-locked months its fields are luxuriant with wheat, barley, and millet, so that it has come to be called the «Garden of China.» In the warmer portions the grape vine, indigo, cotton, opium, tobacco, sorghum, rice, ginseng, etc., are cultivated, the opium poppy being a valuable crop. Oleaginous beans are extensively grown for the oil yielded by them, and form the staple articles of export. The silkworm also is reared. The mineral wealth of Manchuria is great, but as yet is little developed. Iron, gold, silver, coal, peat, etc., occur in abundance. The Manchus are a Tungusian race. They are of a lighter complexion and a more powerful build than the Chinese, have the same conformation of the eyelids, but their countenances are far more expressive and intellectual. In the 17th century they invaded China, and placed their leader's son upon the throne. Since that time the Manchu dynasty has continued to reign in China, the Manchu language being the court and official language. Manchuria possesses a native population of 22,000,000, of whom 12,000,000 inhabit the southern province of Sheng-King, 8,000,000 the central province of Kirin and 2,000,000 the wild northern province of Hilung Kiang. A great immigration from Russia, China, Korea and Japan, took place especially after the Russian occupation in 1900. (See China, paragraph *Events of 1902–3.*) For a considerable time prior to 1891, when the first sod was turned for the construction of the great Siberian railroad, the Russian government was anxious to secure control of this territory. When Japan in 1895 occupied the Liao-Tung Peninsula of Manchuria and began to fortify Port Arthur as its southern tip, Russia, with two other powers protested. Weak, though victorious, Japan withdrew, shortly afterward to learn of the secret treaty of Count Cassini by which Russia leased Port Arthur from China for twenty-six years. Having obtained this foothold, the Russians cast covetous eyes on the vast territory which lay between, and under the commanding influence of Admiral Alexieff, generalissimo of the Russian military and naval forces in the Far East, who, in 1903, for his services was proclaimed by imperial ukase Viceroy of Greater Russia and Lord of all the lands which lie between Baikal and the Pacific and which extend from the Arctic to the Yellow Sea, they accordingly began a pacific conquest by colonization on an unparalleled scale. The route of the Siberian railroad was originally surveyed with Vladivostok on the Pacific coast of Russian Asia as the terminus. Port Arthur, however, washed by the warmer waters of the Yellow Sea, now became the coveted goal.

A corporation known as the Russo-Chinese Bank was established, which to all appearances was a mutual combination of Russian and Chinese capital. Although the bank was only another name for the Department of Finance of the Russian empire, yet its name pleased Mongolian vanity and won respect, the Chinaman having as great esteem for a banker as he has contempt for a soldier.

There were times when China was short of ready cash, and the Russo-Chinese Bank each time went to her aid. Therefore when China was asked to grant a concession for a railroad from the Siberian trunk line to Liao-Tung Bay, and the Russo-Chinese Bank offered to furnish the necessary $250,000,000, China could not well refuse. With the same discretion with which the bank was named, the railroad was called the Russo-Chinese railroad. On its stationery were the grouped flags of China and Russia. These flags also appeared on the cars and engines, and on days of popular festivity they floated over the depots.

After the road was built some Chinese awakened to the railroad's true purpose. They discovered that it penetrated the most fertile as well as the most densely populated districts of Manchuria, and had for its terminus the Russian fortress of Port Arthur. On the north it joined with the Siberian trunk line at Harbin, on the mighty Sungara. It passed through the cities of Tsitsihar, Kirin and Mukden, capitals of the three Manchurian provinces. It tapped the Gulf of Liao-Tung, by means of the port of New-Chwang, and skirted the whole eastern coast of this arm of the Yellow Sea.

When the other powers became alarmed at the armies of soldiers which kept pouring in with every train from Siberia and European Russia, the officials of the Czar explained that they were simply "railway guards," and, to further prove that their presence was wholly warrantable, they pointed to a sentence of the railroad's charter, which permitted Russia to guard the railway with troops, but did not limit their number. Faster than the soldiers, however, came the colonists. Families were gathered from all parts of the Czar's western dominions, and put aboard trains of the Siberian railroad at Cheliabinsk, the border town between European and Asiatic Russia. They were charged nothing for transportation. Their wants were cared for on the way. At each railroad station along the 6,000 miles of track there was hot water and fuel where they might cook, and markets of wooden sheds where they might buy food from the peasants at low cost.

Every inducement now was held out to the Russian settler. To each male member of the household was given 100 acres, and oftentimes a man who had a large number of sons assumed ownership of more than a square mile. In addition to the land the government furnished the settler with agricultural implements, carpenter tools and cattle, and even advanced him money, to be repaid at an insignificant rate of interest. But although immigration amounted to nearly 200,000 a year, it did not penetrate far from the railroad. The region is too vast.

Consequent on the Boxer massacres and troubles of 1900 a Russian military force occupied the right bank of the Amur River, declared it to be Russian territory and established a provisional Russian administration. On 8 April 1902 the Manchurian convention between China and Russia was signed, wherein Russia agreed to evacuate Manchurian territory within 18 months. But Russia could not then voluntarily withdraw. The civilization of the Slav had rooted itself too firmly in this soil to be eradicated except by a political cyclone. One could see everywhere, from Port Arthur at its extreme southern end to the Amur River, the old Russian boundary, on the north, evidences of the Muscovite occupation. Under the direction of Russian engineers native laborers were building railroads and military highways, constructing wharves, marking out vast farms and laying out cities. The Russian fortress was found wherever a strategic site would make Russian cannon still more formidable, and almost in the shadow of these guns rose the peaceful sanctuaries of the Orthodox Greek, with their white walls and green roofs and cupolas.

For the purpose of supplying her thousands of colonists with a great seaport and commercial outlet, Russia had built the city of Dalny (q.v.), 14 miles from Port Arthur, on the eastern side of the Liao-Tung Peninsula. Engineers built its wharves, laid out its streets and even planted trees along driveways intended for pleasure vehicles before the inhabitants arrived. The population grew rapidly and the lines of the steamships which load here directly from the cars of the Siberian railroad increased in number and in frequency of service, while bids were received at Port Arthur by the Russian authorities for the construction of electric light plants and electric railways for Mukden, Harbin and New-Chwang.

On 8 Oct. 1903 the Russian government was pledged to evacuate Manchuria, yet when that day came she only poured in more soldiers, and made a great naval demonstration, her actions creating international uneasiness.

For Japan and Great Britain from political as well as commercial motives, and the United States on account of commercial rights obtained by the Shanghai treaty to trade freely with Manchuria, were particularly interested in insuring the integrity of the Chinese Empire, its administrative control over its Manchurian provinces, and the maintenance of the principle of the "open door." Furthermore, Russia added to the trouble which was brewing over her continued occupation of Manchuria, by opposing Japan in refusing to allow Korea to open the port of Wi-ju to foreign trade, or to permit Japan to lay a telegraph line from Seoul to Fusan, Russia, however, obtaining from the Korean government, a timber-felling concession south of the Yalu, and also having a telegraph line in working order in Korean territory. Japan had great interests at stake. Russia in Manchuria was a constant menace to the independence of Korea, over the suzerainty of which Japan had successfully fought China in 1894-5.

Japan, in assimilating all that was best of Occidental civilization, had learned all that was worth learning of European diplomacy, and by treaty revision and her correct attitude during the Chinese War and the Boxer troubles, had raised herself and been admitted to the rank of a civilized world power. Soon after Russia, with the aid of France and Germany, had secured a diplomatic victory over Japan in obliging her to withdraw from the Liao-Tung peninsula, which she had occupied by right of conquest over China in 1894–5, Japan had effected a defensive and offensive alliance with Great Britain, whereby that power was pledged to intervene in any future conflict, should any third party again interfere with Japan's political arrangements. Already in July 1893 Japan had opened negotiations with the Russian Government «with a view to a friendly definition of the interests of the two countries in Manchuria and Korea where those interests meet, and thereby to remove every cause of conflict between Japan and Russia.» She now redoubled her efforts in that direction. Russia, it is alleged, unduly delayed her replies, or proposed such amendments as were altogether inconsistent with Japan's idea of an amicable settlement, thus making the situation more and more complicated.

Besides, Russia made great naval and military preparations, despatching all her most powerful war vessels to the extreme Orient and sending military reinforcements to Manchuria and the neighboring regions. Japan, having made all necessary preparations for self-defense, and believing further delay would increase her danger, concluded to break off negotiations with Russia, and accordingly, on 5 Feb. 1904 telegraphic instructions were issued to the Japanese Minister at Saint Petersburg to announce to the Russian Government that Japan had terminated negotiations relative to the proposed Russian convention; that they would take such independent action as they might deem best to defend and consolidate their established rights and legitimate interests, and that they would sever diplomatic relations with Russia and withdraw their legation. The communication was made to the Russian Government the following day.

Russia, on the other hand, claims that her negotiations with Japan were conducted with the object of reaching an amicable and an honorable adjustment of their differences; that she had no reason to expect war, and as a proof of this assertion points out the fact that she was not prepared for war; had she expected war, no consideration would have induced her to withdraw her troops from the Chinese territory and thus lose the opportunity of ending the war quickly. While faithfully adhering to the terms of her treaty regarding Manchuria, she had withdrawn the major part of her troops from that province. Russia claims to be fighting to defend her position in the Far East — for vast interests which it would be foolhardy for her to abandon. Having acquired her present foothold in this Chinese province through the pacific channels of diplomacy and not through the right of military conquest, as is generally supposed, Russia's purpose was to develop Manchuria, and to reclaim an unproductive waste. China, of her own free volition, conferred upon Russia permission to build a railroad through Manchuria to Port Arthur, and it was from Russia that China obtained a loan of $100,000.000 to pay the war indemnity to Japan. Another friendly act on the part of Russia, in co-operation with France and Germany, was to save to China the Liao-Tung peninsula, which Japan had seized as a part of the spoils of victory. Upon the basis of the right to commercial exploitation thus peaceably obtained, Russia built a railway into and through Manchuria; she built bridges, roads, and canals; she built cities, whose rapid construction and wonderful strides in population and industry have no parallel in Europe or Asia, perhaps even not in America; Harbin and Dalny are monuments to Russian progressiveness and civilization; these undertakings cost Russia more than $300,000,000, and to have abandoned them in the face of the menacing attitude of Japan would have been an act of stupendous folly. Had the menace not existed, and had China not failed to offer satisfactory guarantees of adequate protection to Russia's interests in Manchuria, Russia would have cheerfully continued to carry out her arrangement with China for the withdrawal of her Imperial forces from Chinese territory; if the Russian army was sent to Manchuria, it was solely for the purpose of protecting her interests from the destructive designs of the fanatical hordes of soldiers and Boxers whose rallying cry was «death to all foreigners»; had not Russian troops gone into Manchuria, that province would doubtless have witnessed scenes of carnage, pillage, and wanton destruction that would have created a sensation throughout the world. Russia restored order in Manchuria; she held her military forces there pending an adjustment of the differences between China and the powers. In the progress of the negotiations begun in the summer of 1903 between Petersburg and Tokyo, Russia claims to have showed a most conciliatory spirit; she modified her terms time and again, so intent was she upon preserving the peace. Having made marked concessions solely in the interest of peace, Russia awaited the Japanese answer, but before the Russian minister at Tokyo could deliver his reply, the Japanese answer came in the shape of a torpedo attack at midnight.

Meanwhile, early in January, the Chinese Emperor signed a new commercial treaty with the United States, which conferred on all powers new trade privileges in Manchuria, and also signed a similar treaty with Japan. This action, notwithstanding the Russian Government's apparent acquiescence, was violently assailed by the rigidly censored Saint Petersburg press, which denied the right of China to confer the privileges, declaring it impolitic for China to offer freedom of trade on territory not altogether its own, without previously obtaining the consent and permission of Russia, who would not permit its lawful rights to be interfered with. Notwithstanding, President Roosevelt nominated consuls for Mukden and Antung, the Manchurian cities now opened to trade.

In 1894 and 1895, Manchuria was the field of war between China and Japan; in 1900 it was the district in which the Boxer movement was most destructive, and now in 1904 it became the theatre of war between Russia and Japan. War commenced without a formal declaration on 9 February by the destruction in the harbor of Chemulpo, Korea, of the Russian ships Variag and Korietz, which, after being ordered to leave, opened fire on the Japanese vessels under Admiral Uriu. The same night Japanese torpedo boats made an attack on the unsuspecting Russian fleet in Port Arthur, disabling some of the best ships. Having gained practical control of the sea, the Japanese landed their armies, and by their brilliant naval and land campaigns, early in September 1904, had destroyed Russia's naval supremacy in Asiatic waters, involved Port Arthur in a protracted siege, and had driven the Russian army back on Mukden, the ancient capital of the Manchus and southern Manchuria.

Some of the more striking events of the war by sea were the persistent attempts of the Japanese admiral Togo to block Port Arthur, the blowing up of several Russian ships by mines, especially the destruction of the Petropavlosk 13 April, when the vessel sank with 800 men including Admiral Makaroff, "the Cossack of the sea," and the war artist Verestchagin; the blowing up of the Japanese battleship Hatsuse, and the ramming of the Yoshimo on 15 May, with great loss of life; the destructive raids of the Russian Vladivostok squadron on Japanese transports, and seizures of neutral vessels chiefly English and German, including the unwarranted sinking of the British ship Knight Commander which led to diplomatic complications with Great Britain; and the practical annihilation of the Vladivostok squadron by the Japanese admiral Kamimura 14 August, when it attempted to co-operate with a sortie of the Port Arthur fleet which also was hopelessly crippled by Admiral Togo, the Russian admiral Wittshoeft being among the killed, and the vessels driven back to Port Arthur, or forced to seek shelter in neutral ports. One in Chefoo harbor resisting a Japanese search party, was seized and taken out from Chinese protection, a breach of neutrality which the Japanese administration defended; while the Novik escaped to Sakhalin island where she was followed and destroyed by two Japanese cruisers.

By land, the Japanese armies led by Gens. Kuroki, Oku, and Nodzu, notwithstanding desperate Russian resistance, were irresistible in their onward progress. After a six days' fight, Kuroki on 1 May forced the passage of the Yalu near Wiju against the Russian general Sassulitch; Oku on 20 May stormed Kinchow and Nanshan hill, driving Gen. Stoessel and the Russians back on Port Arthur, and capturing Dalny; and while Gen. Nodzu beleaguered Port Arthur, Gens. Oku and Kuroki during a three-days' battle at Telissu (Vafangow), 14–16 June, defeated Gen. Stakelberg, whom Gen. Kuropatkin had detached with a force of 30,000 men and sent to the relief of Port Arthur. The Japanese occupied Yinkow, the port of New-Chwang, and on 25 July at Tashi-chao they again defeated the Russians, and occupied New-Chwang, the important treaty-port through which practically all foreign trade enters Manchuria, and an important base for the landing of further Japanese troops and supplies. The Japanese generals were now joined by Field-Marshal Marquis Oyama and his chief of staff Gen. Kodama. The Russians made heroic attempts to retard the Japanese advance, but were forced back on Liao-Yang, which Gen. Kuropatkin, the Russian commander-in-chief, had strongly entrenched and fortified, fully determined here to check the Japanese advance and to repair Russian military prestige. One of the fiercest battles in history began on 30 August, and after three days of the severest fighting, Gen. Kuropatkin, endangered by a successful flanking movement of Gen. Kuroki, was compelled to abandon Liao-Yang, and retire on Mukden, the battle raging incessantly during the five days' retreat.

On 4 Sept. the Japanese army occupied Liao-Yang and began to fortify the city for use as a base of supplies. In the meantime they had completely surrounded Gen. Stakelberg and his force of 30,000 and his retreat had been cut off by Gen. Oku, but on 4 Sept. he finally succeeded in extricating himself and rejoined Kuropatkin, thus leaving the garrison at Port Arthur to defend the city as best it might without hope of a relief force ever reaching the city from the land side.

With the exception of some desultory fighting the armies lay dormant for three weeks, the Russians constantly receiving supplies and fortifying Mukden, while the Japanese intrenched themselves in the positions they had gained.

On 18 Sept. the Japanese began shelling the fortifications around Mukden and launched a series of small attacks against the Russian outposts but with no great gain to them. On 4 Oct. Gen. Kuropatkin assumed the offensive pushing the bulk of his army across the Hun River, along the main road toward the railway station and the Yen-Tai coal mines. Here he was faced by Gens. Oku with the Japanese left guarding the railway, Nodzu with the centre guarding the mines and the main road, and Kuroki with the right ready to flank any forward movement, only awaiting developments to make a dash to cut off retreat and hem the enemy in and thus inflict a crushing defeat. The Russian general evidently planned to break through between the right wing under Kuroki and the centre under Nodzu for the main attacking force was directed against Nodzu's division. This series of engagements, known as the Battle of the Shakhe River, lasted for 11 days from 6–17 Oct. and was marked by even heavier and fiercer fighting than was witnessed at Liao-Yang. The losses to both sides were enormous, though the Russian army was by far the heavier loser, their loss being officially placed at 45,000 killed, wounded, and missing while the Japanese loss was only 15,879. Though the Russian advance had been checked by the 9th, the Japanese were not able to press the advantage, the net result showed no gain to either contestant. and for several weeks after the serious fighting subsided both armies took a much needed rest, beside which the cold weather had set in and made operations extremely difficult.

During these months operations by land and by sea before Port Arthur had been carried on with varying success but the laurels generally resting on the Japanese arms. On 7 Aug. and the few days immediately following the Russian positions on the Taku and Shaku mountains were captured and the Orlung and Keckwan forts occupied. On 4 Sept. the minor forts east of Golden Hill were taken; by 19 Oct. several positions near the Rihlung Mountain had been taken and by the 26th the entire Russian outpost in this vicinity captured. Then for almost a month the operations consisted of small attacks by the besiegers and sorties by the defenders, the final assault of the Japanese resulting in the taking of 203-Meter Hill on 2 Dec. This entailed a loss of over 15,000 men to the Japanese army but enabled them to mount their heaviest siege guns on a hill which commanded both the town and the harbor. This systematic bombardment forced the surrender by Gen. Stoessel, on 2 Jan. 1905, of the entire garrison and the ships within the harbor. The Russians had before the surrender lost about 25,000 men and of the naval force the battleships *Pobieda, Retvizan, Peresviet, Sevastopol,* and *Poltava;* the cruisers *Bayais* and *Pallada;* and the gunboats *Giliak* and *Amur* had been battered and sunk. With the surrender they further lost, in prisoners 23,491 men and 878 officers, including eight generals, four admirals, and 57 colonels, while 80 officers were paroled; 50 permanent forts; 546 large guns; vast quantities of all supplies and munitions of war; and with the destruction of the fleet all hope of gaining the supremacy on the sea. The Japanese loss consisted: in the navy of the battleships *Yashima* and *Hatsuse,* and the cruisers *Nisshin, Saiyen,* and *Miyako* — all by mines; the protected cruiser *Takasago;* the gunboats *Oshima* and *Atago;* and the destroyers *Akatsuhi* and *Hayatori;* in the army of about 50,000 men during the entire operations. They had gained however, beside the supplies for land operations, 4 battleships, 2 cruisers, and 14 gunboats and destroyers, and command of the sea.

With the fall of Port Arthur, fighting was resumed by the armies at Mukden. Gen. Kuropatkin attempted to turn the Japanese left flank in the direction of Liao-Yang but after six days of severe fighting his attack was repulsed with a loss of 15,000, the Japanese loss being placed at 7,000. By the middle of February Marshal Oyama had been reinforced by an army of 100,000 veterans from Port Arthur under Gen. Nogi, who had come by forced marches to the scene of operations in the north. Another army under command of Gen. Kawamura had mysteriously entered the battle arena, having probably been operating under cover of the larger armies, between Kuroki and Vladivostok.

Thus the three armies under Oyama had maintained the same relative positions they had occupied during the march from Hai-Cheng northward. They had however been supplemented by two others: that under Nogi being placed on the west of Oku and forming the extreme left, and by that under Kawamura to the east of Kuroki and constituting the extreme right wing. Briefly stated the Japanese army consisted of the left wing under Oku and Nogi, the centre under Nodzu, and the right under Kuroki and Kawamura; in all a vast body about 400,000 strong, stretching crescent shape over 100 miles of plains and hills from Chang-Tau eastward across the railway to Lone Tree (Putiloff) Hill. The Russian army, numbering about 350,000, occupied all the strong positions and moreover was fighting on ground of its own selection. On 20 Feb. a general advance was made against the Russians, the fighting resolving itself into a game of flanking. Kuroki's right crossed the Sha-ho River, swung across the Russian left, attacked it in the mountains, drove it from its positions and precipitated it in full retreat northward. Nogi, by 3 Mar., had driven in the Russian right wing, effected a junction between his right and the left wing of Oku's army about eight miles south of Mukden and proceeded to pound Kuropatkin's centre. While the armies of Oku and Nodzu drove a wedge through the Russian centre, Nogi's extreme left by a forced march of 40 miles also fell upon the centre, completely demoralizing it and almost annihilating a whole corps. By 5 Mar. the Japanese army was within five miles of Mukden; on the 8th Kuroki forced the Russians to retreat and evacuate all positions south and southeast of Mukden; on the 9th drove them toward Fushun, the railway between Mukden and Tieling was destroyed, and all the region west of the railway and south of the Hun River fell into the hands of the Japanese; on the 10th Mukden was occupied and the retreat had been turned into a rout; on the 11th the Fushun was captured and the Russians forced back to Tie-Pass, which by the 16th had fallen before the fierce onslaughts of the Japanese army.

This ended the Battle of Mukden proper. On 16 Mar. Kuropatkin was relieved of the command of the army and was succeeded by Gen. Linevitch. The retreat resolved itself into an attempt to save as many large bodies of troops as possible from being cut off and destroyed. By the 20th they had gone 27 miles above Tie-Pass, laying waste the lands as they went and thus hindering the Japanese advance so effectively that Harbin was reached by the remnants without further serious loss, though the rear guard was constantly harassed by the Japanese advance posts. The Russian loss at the Battle of Mukden was officially placed at 1,900 officers and 87,000 men, killed, wounded, and prisoners, and the Japanese loss was placed at 57,000. With the fall of Mukden, the Japanese captured 70 large siege guns, 60,000 rifles, many railroad cars and wagons, 2,000 horses and enormous quantities of ammunition, clothing and provisions.

On the capitulation of the Port Arthur garrison in January, the Japanese fleet under Togo was released from blockade duty and lay in wait for the Baltic fleet under Admiral Rojestvensky, which, after starting on 4 Oct. 1904, embroiling Russia with Great Britain by firing on a fleet of fishing smacks in the North Sea (22–3 Oct.), and wintering at Nossi-Bé, Madagascar, was by easy stages nearing the scene of conflict. On 8 April 1905 the fleet passed Singapore and, sailing for French Indo-China, anchored in Kamranh Bay, thus involving France in a dispute over neutrality, but a few days later sailed away and headed for the Korean Strait. Its progress had been watched by Admiral Togo who had established his base at Masampo, Korea.

At 6 o'clock on the morning of 27 May the Russian fleet was discovered near Quelpart Island, headed for Tsu Island, midway between the Japanese coast and the Korean Peninsula. Upon being informed that the Russian fleet was coming up the eastern channel, Togo moved his fleet eastwardly across the northerly end of Tsu Island, and turned south so as to bar the narrow strait, his inner line held by the battleships under his immediate command, the outer line by the cruisers under Kamimura, while the light cruisers under Uriu were to the north on the lookout for stragglers. By a turning movement Togo placed his ships on the west, thus throwing the Russians to the east and placing the sun directly in their eyes. Shortly after 2 o'clock firing began and soon became general.

As the Russian fleet passed Togo's battleships, the squadron of light cruisers under Uriu broke in on them from the north while the heavier cruisers under Kamimura swung around to the south to head off any possible retreat. Thus they were surrounded, by Uriu on the north, Togo on the west, and Kamimura on the south, all, as they pounded them to pieces, driving them toward the coast of Japan. The fire from the Japanese ships was so effective that by Saturday night the battleships *Sissoi Veliki,* and *Borodino* were sunk. During the night the fleet of torpedo boats took up the awful work and when morning broke it was found that the battleships *Kniaz Suvarov, Alexander III, Oslyabya,* and *Navarin,* the coast defense ship *Admiral Oushakov,* the armored cruiser *Dmitri Domskoi* and the protected cruiser *Svietland* had been torpedoed and sunk. On Sunday, the 28th, the armored cruisers *Admiral Nakhimov* and *Vladimir Monomakh,* which had been badly crippled during the night, were torpedoed and sunk near Tsu Island During the morning Admiral Nebogatov, with five ships, attempted to escape to the north but they were overtaken near the Liancourt Islands and surrendered, the captured ships being the battleships *Nicholas I* and the *Orel* and the coast defense ships *Admiral Apraxine* and *Admiral Seniavin.* The other ship, the *Izumrud,* escaped but after running on a reef Monday night was blown up by her commander. Three cruisers, the *Oleg,* the *Aurora* and the *Jemchug,* under Admiral Enquist, escaped and reached Manila 3 June, where they were interned; the cruiser *Almaz* and three destroyers reached Vladivostok in safety; and one destroyer drifted into Shanghai Harbor on 4 June.

Thus it will be seen that the Russian loss foots up as follows: Sunk — six battleships, the *Sissoi Veliki, Borodino, Kniaz Suvarov, Alexander III, Oslyabya,* and *Navarin;* three armored cruisers, the *Dmitri Domskoi, Admiral Nakhimov,* and *Vladimir Monomakh;* two protected cruisers, the *Svietland* and *Izumrud;* the coast defense ship *Admiral Oushakov;* and six destroyers; captured — two battleships, the *Nicholas I,* and the *Orel;* two coast defense ships, the *Admiral Apraxine* and *Admiral Seniavin;* and the destroyer *Biedovy,* on which was Admiral Rojestvensky; beside which the dead numbered over 7,000 and the prisoners over 4,000. The Japanese loss consisted of three torpedo boats; three officers and 113 men killed and 424 wounded. On 30 May Admiral Togo telegraphed that the battle was called the «Battle of the Sea of Japan.»

The campaign on land was again vigorously pushed. On 16 June Liao-Yang Wo Peng, west of the Liao River, was captured and the Russians driven north after suffering a heavy loss. On 7 July the Island of Saghalien was invaded, this marking the first entry upon Russian territory proper, and after a short but vigorous campaign, on 31 July the governor with 70 officers and 3,200 men surrendered, which with 500 surrendered and 200 killed on the 28th makes the total Russian loss on the island about 4,000; the loss to the Japanese was insignificant.

Meantime a sixth army under General Hasegawa began to invest Vladivostok from the west, a force was landed 17 July on the shores of Olga Bay, 150 miles north of the city to attack from that side and on 4 Aug. a fleet began the blockade of Peter the Great Bay on which the city is situated. In this position the armies were on 5 Sept. 1905.

Yielding to the earnest requests of President Roosevelt to stop the war if possible, both Russia and Japan consented in the latter part of June to hold a conference with peace a possible outcome. Baron J. Komura and Minister Takahira for Japan and Serge Witte and Baron Rosen for Russia were chosen as ambassadors with full powers to arrange terms of peace, and the Portsmouth, N. H., Navy Yard was selected as the meeting place. On 29 Aug. the plenipotentiaries reached a final agreement, the treaty was drafted and signed on 5 Sept. See PORTSMOUTH, TREATY OF.

Manchus, măn-chooz′, a name given the reigning family in China, members of whom sat upon the throne of the empire as early as 1644. They belong to the Tungusic type of Mongolians.

Mancini, män-chē′nē, a name borne by the five nieces of Cardinal Mazarin. They were born in Rome and summoned by their uncle to Paris, where they played a conspicuous part in the court of Louis XIV. during the early years of his reign. They were: (1) LAURE (b. 1636; d. 1657), the amiable and pious companion of Louis XIV.'s boyhood. She became the mother of Louis, Duke of Vendôme, one of the greatest generals of the Grand Monarque. (2) MARIE (b. 1639; d. about 1715), for whom the king conceived a violent affection, but in 1661 Mazarin gave her in marriage to Prince Colonna, constable of Naples. (3) OLYMPE (b. 1640; d. 1708), a witty and attractive woman, who became wife of Eugène de Savoie-Carignar, count of Soissons, and mistress of the queen's household. (4) HORTENSE (b. 1646; d. 1699), the most attractive and beautiful of the Mancini. In 1666 she left her husband, the Duke de Mazarin, and became one of the chief beauties of King Charles II.'s court. The king pensioned her, and after the revolution of 1688 she lived in retirement in Chelsea. (5) MARIE ANNE (b. 1649; d. 1714) was the wittiest and most vivacious of the sisters. In 1662 she married the Duke de Bouillon, and her salon became the centre of social and intellectual life at Paris. She patronized La Fontaine, Corneille, and Molière. She died in Clichy.

Manco Inca I., ĭng′ka, Peruvian ruler; b. about 1500; d. 1544. He was the second son of the inca Huayna Capac (q.v.), who died about 10 years after the first arrival of the Spaniards, dividing his kingdom between his legitimate successor Huascar and a younger son, Atahualpa. The latter, after having made war upon Huascar, and put him to death, was himself captured and executed in 1533 by Pizarro. Shortly afterward

Manco appeared in the Spanish camp to announce his pretensions to the throne and claim Pizarro's protection. The conqueror received him cordially, and made it his first care after the taking of Cuzco to place him on the throne. After in vain petitioning for power to exercise the sovereignty, he withdrew secretly from Cuzco, but was brought back and imprisoned. Again escaping, he roused the whole nation to arms against the invaders, and appeared before Cuzco (February 1536) with a countless host of Indians who covered the surrounding hills. He destroyed a large part of the city by fire, and reduced the Spaniards to extremities; but after the siege had lasted over five months, had to withdraw on account of the scarcity of food. Defeated subsequently by Almagro, and forsaken by most of his warriors, he fled to the Andes, and for several years maintained his independence sallying forth as occasion offered at the head of a few brave followers, always eluding pursuit in the wilds of the Cordilleras, and in the event of civil war among the foreigners throwing his weight into the weaker scale in order to prolong their contests. He was killed by a party of Spaniards belonging to the younger Almagro's faction, who on the defeat of their leader had taken refuge in the Peruvian camp.

Mandæans, măn'dē'ạnz, an ancient Oriental religious sect of mixed Christian, Jewish, and heathen elements. They are still found on the east shore of the Tigris, working as jewelers, blacksmiths, carpenters, etc. Their religion is a kind of Gnosticism, retaining various Jewish and Parsee elements. They worship a number of personifications, particularly of the attributes or names of God. They publicly call themselves Sabians (*Subbâ,* “baptists”), thus professing to identify themselves with the Sabæans tolerated in the Koran. They were formerly called Christians of St. John the Baptist from their habit of baptism or ablution. They have five important sacred books: ‘Sidrâ rabbâ’ (“the great book”), called also “ginza,” “treasure”; ‘Sidrâ de Yahyâ’ (‘Book of John’); the ‘Qolasta,’ a collection of hymns; ‘Diwân,’ a ritual; and ‘Asfar Malwâsê,’ a manual of astrology. The Mandæans had three degrees in the priesthood, with a supreme official (Rish ammâ) as the source of both civil and ecclesiastical authority. The priests officiate in white robes, barefooted, and women may be admitted to their order.

Mandaites. See NAZARENES.

Mandalay, măn'dạ-lā, East India, capital of Upper Burma; two miles from the left bank of the Irawadi, a little north of Amarapura (q.v.), the former capital, and about 410 miles north of Rangoon. It was founded in 1860, was the capital of independent Burma until its capture by the British in the end of 1885, and since the treaty by which (1886) the king lost his throne it has been the capital of Upper Burma. The area is six square miles. The most famous building in Mandalay is the Aracan Pagoda; it contains a brazen image of Buddha, 12 feet high. In the centre of the town stands what was once King Theebaw's palace. Outside the enclosures of the city was, until the British conquest, a crowded, dirty native town, now cleared away to make room for a British cantonment. The present native quarters lie outside the fortified city. Beyond them, again, on the slopes of the hills that border the valley of the Irawadi, are numerous fine monasteries. Silk weaving is the most important of the industries; some of the others are gold and silver work, ivory and wood carving, bell and gong casting, and knife and sword making. In 1886 and in March 1892 much damage was done by fire and by an inundation of the river. In 1886 a meteorological observatory was built. Kipling (q.v.) called special attention to this ancient city by his poem ‘Mandalay.’

Manda'mus, in law, a writ issued by a superior court and directed to some inferior tribunal, or to some corporation or person exercising public authority, commanding the performance of some specified duty. In general practice in the United States a mandamus issues where a party has a right to have a thing done, and has no other remedy, and in some cases where he has another but a tedious and inadequate one; and must be applied for without delay. It is either in the alternative, ordering the court, corporation, or party to which or whom it is directed to do the thing specified, or to appear and show cause why it should not be done; or absolute, commanding the thing specified to be done without any condition or alternative. The writ is usually first issued in the alternative, and in case of there being no appearance, or no sufficient cause to the contrary being shown, an absolute mandamus is issued. The cases enumerated for the issuing of this writ are — to compel the party applying to be restored to some office or franchise of a public nature, whether temporal or spiritual; for the production, inspection, or delivery of public books and papers; to oblige bodies corporate to affix their common seal; or to compel the holding of a court. It may be directed to an inferior court, ordering it to proceed in the hearing of a cause, or to enter up a judgment.

Man'dan, N. Dak., city, county-seat of Morton County; on the Missouri River, and on the Northern Pacific railroad; about five miles above Bismarck. In the vicinity are extensive coal mines, and on the large ranches are raised cattle and sheep. Considerable wheat is cultivated on the farming lands. Nearby are a number of the ancient mounds somewhat similar to those in Ohio and other parts of the United States. The State Reform School and Indian schools are located here. The city is the headquarters of a railroad division and has large railroad shops. Pop. (1910) 3,873.

Mandan, a tribe of American Indians of the Siouan family, the remnants of which number less than 300, are settled upon the Fort Berthold Reservation in North Dakota. In 1778 the Mandans occupied nine villages upon both sides of the Missouri River near Saint Louis, but wasted by smallpox and decreased by numerous battles with the Sioux, they removed further up the Missouri. In 1804 they were found by the Lewis and Clark Expedition (q.v.) occupying two villages at the mouth of the Knife River. In 1837 when a smallpox epidemic destroyed thousands of American Indians the Mandans were still further reduced in numbers from 1,700 to less than 400. In 1846 the remaining families of the tribe took up their residence at the Fort Berthold Reservation. The Mandans were not a nomadic people, but resembled the Pawnees, living in log houses with village administration and local government. They were an agricultural people, raising corn, tobacco and other crops.

Man'darin, the term usually applied in China by foreigners to government officials of every grade. It is supposed to be derived from the Portuguese *mandar*, to command, or from the Sanskrit *mantrin*, counsellor; the Chinese equivalent is *kwan*, which signifies literally a public character. There are nine ranks, distinguished by different buttons.

Mandarin Duck, a small Chinese duck (*Aix galericuta*) closely related to the American wood-duck (*A. sponsa*), and dressed in an exceedingly beautiful plumage of metallic green, purple, chestnut, white and black. It has long been domesticated by the Chinese, and, as it is said to pair for life, is held up by them as a model of marital virtues; and it has been introduced upon park waters and ornamental grounds in America and Europe.

Mandat, män-dä, the name given to a kind of paper-money in the French Revolution. After the assignats, which had been kept in circulation by the violence of Robespierre, had lost all credit, a new money was created — the mandats — founded, like the assignats on the credit derived from the confiscated property, but with the essential difference that specific pieces of property, enumerated in a table, were pledged for the redemption of the bills, while the assignats furnished only a general claim. These mandats were issued in accordance with the law of 1796, to the nominal value of $480,000,000. A forced circulation was given to them, by which the government was enabled to defray the expenses of the approaching campaign.

Mandate, in law, a term derived from the Roman civil law. It may be defined as a bailment (delivery) of a chattel or chattels to a person who is to do something with or about the things bailed, entirely without compensation. The essential element of the contract lies in the fact that there is not paid or promised, in law or in fact, any compensation whatever for the service to be rendered. The person delivering the chattels is called a mandator; and the person receiving them and undertaking the service is called a mandatary. As it must be a service or an act, the whole benefit of which rests with the mandator, this, by the ordinary principles of bailment, determines the amount of care to which the mandatary is bound, and the degree of negligence for which he is answerable. For negligence in a bailee has in law three degrees: slight negligence, which makes the bailee responsible where the bailment was wholly for his benefit; ordinary negligence, for which he is responsible if the bailment be for the benefit of both parties; and gross negligence, for which only the bailee is responsible where the contract is for the exclusive benefit of the bailor. And as it is not a mandate if the bailee derives any benefit whatever from the service, it follows that a mandatary is responsible for loss of or for injury to the thing delivered to him, only when it is caused by his gross negligence. There is no especial form for the contract of mandate; it may be in writing or by word only, and made very solemnly or in the simplest way; in either case the law is the same. No man can be held in the United States for a breach of any promise, whether that breach be partial or total, if the promise rests upon no consideration. But if he who has made a promise, afterward does some injury to the promisee (and this would be the case if he does something which is positively injurious because it is not completed), he is liable for the injury he has caused, as he would be if there were no promise between the parties. Banks and bankers are so far mandataries, that they receive notes for collection, and render, or engage to render, by agreement or by mercantile usage, these and similar services without any especial or specific compensation. But it is understood that they do this as a part of their business, and for the general and indirect benefit they derive from doing it; and this is undoubtedly consideration enough to make them liable for any injury to their customer caused by their negligence; and it is sufficient to make them liable that their negligence was ordinary, or consisted in the want of common care. And a bank has, as bailee, a lien on its deposits for its general balance against the depositor.

Mandaue, män-dä'wä, Philippines, a pueblo of the province of Cebú, situated on the east coast, on the north shore of Cebú Channel, five miles northeast of the town of Cebú; it is on the coast road. Pop. 15,300.

Mandaya, män-dä'yä, a Philippine tribe of the Malay race living in the commandancia of Bislig, and the district of Dávao, island of Mindanao. They are bloodthirsty, and head-hunters, mostly heathen, though Jesuit missionaries have converted some to Christianity. See Philippine Islands.

Mandel, män'dĕl, **Eduard,** German engraver: b. Berlin 15 Feb. 1810; d. there 20 Oct. 1882. He studied in Paris with Henriquel-Dupont, and in 1842 became professor of engraving at the Berlin Academy. He was one of the greatest of modern German engravers, the most important work of his being the plate of Raphael's 'Madonna di San Sisto,' his latest effort. Consult Pietsch, 'Eduard Mandel und seine Werke' (1883).

Man'derson, Charles Frederick, American lawyer and politician: b. Philadelphia 9 Feb. 1837. He received his early education in Philadelphia, removed to Canton, Ohio, in 1856, studied law and was admitted to the bar in 1859. He was city attorney in Canton 1860-1; at the outbreak of the Civil War he enlisted as a private in the Union army, served in the campaigns in the Middle West, and rose through the intermediate grades to the rank of brigadier-general of volunteers. He was severely wounded at the battle of Lovejoy's Station, Ga., and resigned from the army in 1865 on account of his wounds. He resumed his law practice in Stark County, Ohio, but removed to Omaha, Neb., in 1869. Here he soon became prominent in public affairs, was city attorney for more than six years, and a member of the Nebraska constitutional conventions in 1871 and 1874. In 1883 he was elected to the United States Senate, serving until 1895, and being chosen speaker pro tem in two Congresses, 1889-93. Since 1895 he has been solicitor for the Burlington system of railroads, west of the Mississippi; and was president of the American Bar Association in 1900-1. He has published 'The Twin Seven Shooters' (1902), and several addresses on political and legal subjects.

Mandeville, Bernard de, English writer: b. Dort, Holland, 1670 (?); d. London 21 Jan. 1732-33. He was educated at the Erasmus School, Rotterdam, and at the University of Leyden, where, in 1691, he received the degree of doctor of medicine. The date and occasion of his removal to England are unknown; but he appears soon to have settled in London where with but small success he practised his profession. He lived obscurely, with distillers and Dutch merchants as his ordinary acquaintances. Franklin, in his Autobiography, records that in 1725, at «the Horns, a pale-ale house in —— Lane, Cheapside,» he was introduced «to Dr. Mandeville, author of the 'Fable of the Bees,' who had a club there, of which he was the soul, being a most facetious, entertaining companion.» Franklin at this time was merely a struggling young printer, unknown to fame: Mandeville gained no honor from his acquaintance. Mandeville had, however, a few acquaintances outside his tavern circle. Of these, the most important was Lord Macclesfield, the chief justice, at whose house Mandeville also met Addison. Of their world, however, Mandeville was never a real part, socially or intellectually.

Mandeville wrote much both in verse and prose; but his chief claim to notoriety was the authorship of the 'Fable of the Bees.' This, in its earliest form, consisted solely of a rude poem, in octo-syllabic couplets far from Miltonian, entitled 'The Grumbling Hive, or Knaves turned honest.' In it, he related how, so long as they remained unscrupulous, the bees increased in numbers and prosperity, and how by their moral reformation the bees gained only their material ruin. He concluded that

> "To enjoy the world's conveniences,
> Be famed in war, yet live in ease,
> Without great vices is a vain
> Utopia, seated in the brain.
> Fraud, Luxury, and Pride must live,
> While we the benefits receive."

Of this piece, the earliest known edition is that of 1705. Mandeville's assertion that an earlier edition was printed is unsupported by evidence. In 1714, Mandeville re-printed the poem with prose additions, the whole bearing the new title 'The Fable of the Bees, or Private Vices Public Benefits.' This he further enlarged in the edition of 1723.

At this point, the grand jury of Middlesex interfered, and, in July 1723, presented the 'Fable' as a nuisance. Immediately the book became a subject of general attack. Richard Fiddes and John Dennis in 1724, William Law, Francis Hutcheson in 1725-7, Archibald Campbell in 1728, and Bishop Berkeley in 1732, all assailed Mandeville in turn. By Law and by Berkeley, Mandeville was intellectually outclassed; but he held up his side of the argument, adding to his 'Fable,' in successive editions, tract after tract. That the 'Fable' should be thus attacked is not surprising. Its fundamental thesis, that private vices are public benefits, was as subversive of morality as its illustrative material was foul and its style plausible and forceful. Whether Mandeville was sincere or ironical in his argument is in dispute. That he thoroughly enjoyed his own foulness cannot be doubted. But at least he accomplished one good thing; he pricked the sham morality of Shaftesbury.

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Mandeville, Sir John. The alleged author of a mediæval book of travels which enjoyed great popularity. A large number of manuscripts are in existence, the most important of which are in Latin, French, and English. The earliest version is in French, dating from the latter part of the 14th century, and upon this all the others appear to be more or less directly based. There is no English manuscript antedating the 15th century. The statements in the prolog regarding the translation are to be distrusted, and the autobiographical matter is contradictory. An exaggerated importance has sometimes been attached to the compiler of the work as the father of English prose, because of the statement in one of the English manuscripts that he had translated it out of French into English in order that every man of his nation might understand it. Errors in the translation prove that the man who wrote the French version and the man who made the English rendering cannot have been one and the same person.

The travels consist, in the main, of an account of the Holy Land, and the routes thither, followed by a description of various parts of Asia. The narrative is almost wholly spurious, being made up of paraphrases and borrowings from various sources—travel-books, bestiaries, works on Eastern manners, legends, romances, etc. The first half of the book is chiefly dependent upon the travels of William of Boldensele, a German who flourished in the 14th century, and the second part upon the work of Friar Odoric of Pordenone (ca. 1330). The only portions which may reflect personal experience are those dealing with Jerusalem and Egypt, which it is not impossible that the compiler may have visited. The story abounds in all kinds of adventures and marvels, related with an air of sober truth. There are accounts of monsters and curiously misshapen men, of regions haunted by devils, of the Fountain of Youth, of the Phœnix, of the realm of Prester John, etc. The narrator must have been a man of wide reading, and he certainly displays considerable skill in the selection and arrangement of his materials.

In the prolog the author states that his name is «John Maundeville, knyght,» b. at Saint Albans in England, and that he «passed the see.» in 1622 (1632), whereupon he traveled through various countries. The epilog asserts that the gout forced him to return, and that he occupied his leisure in writing his experiences. It has been found impossible to identify him with any historical John Mandeville.

The tomb of the reputed author of the 'Travels' was long shown at Liège, with an inscription to «Joannes de Mandeville, alias dictus ad barbam.» Important in this connection is the testimony of one Jean d'Outremeuse, in a mediæval 'Myreur des Histors,' to the effect that there died in Liège in 1372, a physician named Jean de Bourgogne, «dit a la barbe,» who declared himself on his death-bed to be «Jean de Mandeville, chevalier, comte de Mont-fort en Angleterre," his real name having been concealed because of a crime committed in England. The veracity of D'Outremeuse is open to suspicion, but it has been thought that this Jean de Bourgogne may have been one John de Burgoyne, who was forced to leave England in 1322, and that he compiled the 'Travels,' borrowing the name of one John de Mandeville, who was concerned in the murder of Gaveston. At all events, Jean de Bourgogne was known in mediæval times as the author of a treatise on the plague, which is bound up in one instance with a version of the 'Travels.' It seems probable, then, that this man, whatever his past history may have been, was the real author of the latter work, and that he preferred to conceal his identity under the pseudonym of Mandeville.

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Mandingoes, măn-dĕng'gōz, a native tribe of West Africa, remarkable for their intelligence. The original country of this people was the north slope of the high table-land of Senegambia, between the head-waters of the Niger and Senegal. Their language is more widely diffused, and more employed by translators, than that of any of the other languages of West Africa. They formed at one time a single large empire, but are now widely scattered. Their religion is Mohammedan.

Man'dolin, a musical instrument, belonging to the lute species, played with a quill or plectrum as well as with the finger. It is of Italian origin, but latterly has become common in all civilized countries. In the usual form it has four pairs of metallic strings and a finger-board or neck with numerous frets across it. Operatic composers have occasionally employed the mandolin to obtain characteristic effects.

Man'drake, a genus of perennial herbs (*Mandragora*) of the order *Solanaceæ*. The species, of which only three are described, are almost stemless, thick-rooted, and large-leaved, with rather large whitish or bluish bell-shaped flowers, followed by globular berries. The plant is chiefly interesting from the numerous allusions to it in old writings, the superstitions relating to it being mainly in connection with its fetid, reputedly poisonous root, which, from a fanciful resemblance of its roots to the human figure, was considered an aphrodisiac.

The May-apple (*Podophyllum peltatum*), of the order *Berberidaceæ*, is often called "mandrake" in the United States, where it is common east of the Mississippi River. It is a perennial herb which sends up umbrella-shaped leaves, usually two at the summit of a stem and bearing one or two creamy, fragrant flowers in the axil. A mawkish yellow fruit about the size of a large cherry develops during early summer. The fruits "are relished by pigs and boys." The creeping rootstocks have been used medicinally.

Man'drill, the largest, and one of the most repulsive and savage of the African baboons. See Baboon and compare Drill.

Maned Wolf, a long-legged, slender-bodied, long-nosed, brightly reddish wolf (*Canis jubatus*) of eastern South America, which may be regarded as one of the "aguaras" or fox-dogs (q.v.). It is a denizen of forests, not being known south of the northern edge of the Argentine pampas; and goes about alone at night and secretly, seeking its food, which consists mainly of small rodents, frogs, insects, and the like, and even some fruit. It will sometimes attack sheep, but is remarkably timid, and no one fears it.

Manes, mā'nēz, among the Romans, the souls of the dead. The good spirits were also called *lares,* and the evil *larvæ*. The manes were reckoned among the infernal gods; but a belief was prevalent that they sometimes appeared upon the earth in the form of ghosts, particularly on the 30th of August, 4th of October, and 7th of November; whence the Romans considered these unlucky days.

Manes Worship, from Roman *Manes* (q.v.), a term to denote the worship of the dead, whether of an ancestor of the particular worshipper or of some deified hero of his race. Herbert Spencer thinks it developed from the belief in an other self, which survived after death, and that manes worship was the outcome of a desire and endeavor to propitiate the ghost. Sir John Lubbock says of manes worship that it "is natural development of the dread of ghosts."

Manet, Edouard, ed-oo-är mä-nā, French painter: b. Paris 1832; d. there 30 April 1883. Sprung from a family of lawyers, he was destined for the same profession and sent to travel in South America to distract his mind from a youthful resolution to become a painter. But on his return to Paris in 1850 he insisted on entering the studio of Couture, from whom he seems to have received little inspiration; but after his travels in Germany, Holland, and Italy, and much study of Rembrandt, Tintoretto, Velasquez, and Goya he launched out into an entirely new style, which has been denominated Impressionism (q.v.). He emphasized what may be styled the light values of color (see Values of Color) and disregarded the relative or corresponding values of conventional art. His breadth of treatment sometimes seemed to end in the flattest naturalism, and the influence of the photograph is manifest in all his pictures. In the Salon of 1861 he exhibited the 'Guitar Player'; and his next canvas, 'Breakfast on the Green,' created much discussion, from the daring manner in which the painter had grouped nude female figures with men in conventional dress. Being excluded from the Salon, he founded his "Salon of Rejected Pictures," and became the head of the new school of Impressionists. Among his most characteristic pictures are 'Boy with a Sword' (1860), in the New York Metropolitan Museum; 'Le Bon Bock,' a portrait of Belot, the engraver, drinking beer, which is familiar from many reproductions; 'The Garden' (1874), an open air scene, which reveals all the special features of the new school. His 'Buffet at the Folies-Bergères' reveals his tendency toward the portrayal of low life. He was also active in the execution of pastels, and illustrated Cros, Champfleury, and Poe. Consult: Zola, 'Edouard Manet' (1867); and Bazire, 'Edouard Manet' (1884).

Manetho, Egyptian historian of the 3d century B.C. He was the first who wrote a history of his native country, and an account of the Egyptian religion, in the Greek language. His history was based on ancient Egyptian documents, and more especially on the sacred books of the Egyptians. It was divided into three books, the first of which gave the fabulous or mythological history of Egypt previous to the 30 dynasties, along with the history of the first 11 dynasties; the second, that of the 8 following dynasties; and the third, that of the remaining 11 dynasties from the 20th to the 30th, inclusive, ending with the reign of Nectanebus, the last of the native Egyptian kings. The period embraced by the pre-dynastic history was calculated by Manetho himself at 24,900 years, and that of the 30 dynasties at 3,555 years. The history of Manetho is lost, but the lists of the dynasties are preserved in Julius Africanus and Eusebius, and some fragments of the work are to be found in Josephus, in his work against Apion. The work of Manetho's on the religion of the Egyptians was entitled 'Tōn Physikōn Epitomē.' It is also lost. The only work bearing the name of Manetho which has come down to us is an astrological poem entitled 'Apotelesmatika,' and it is spurious. Consult: Boekh, 'Manetho' (1845); Unger, 'Chronologie des Manetho' (1867).

Maney, George, American soldier and diplomat: b. Franklin, Tenn., 24 Aug. 1826; d. Washington, D. C., 9 Feb. 1901. He was educated at the University of Nashville, fought in the Mexican War (1846–7), in 1849 was admitted to the bar, and in 1849–61 practised law. On 1 May 1861 he became colonel of the 1st Tennessee infantry, and at Shiloh (6–7 April 1862) he commanded first his regiment and later the 2d brigade of the 2d division. Promoted brigadier-general for his conduct at Shiloh, he commanded the 3d brigade of Cheatham's division in Bragg's army at Murfreesboro (31 Dec.–3 Jan. 1863) and Chickamauga (19–20 Sept. 1863), subsequently was appointed to the command of Cheatham's division, and participated in the battle of Atlanta (22 July 1864). In 1876 he was nominated by the Republican party for the governorship of Tennessee, but before the election retired from the contest. He was minister to Colombia in 1881–3, and to Paraguay and Uruguay in 1889–93. In 1884 and 1888 he was a delegate to the Republican national conventions of those years. In 1868–77 he was also president of the Tennessee and Pacific railway.

Man'fred, king of Naples and Sicily, 1258–66: b. about 1231; d. 26 Feb. 1266. He was a natural son of the emperor Frederick II., on whose death, in 1250, he became Prince of Tarentum, and acted as regent in Italy in the absence of Conrad IV., his half-brother. After the death of Conrad he was regent of the kingdom during the minority of his nephew Conradin. At the instigation of Pope Alexander IV. a crusade was preached against him, and Manfred was temporarily driven from his kingdom, which, however, he soon recovered, and on the rumored death of Conradin, had himself crowned king of Palermo, 10 Aug. 1258. The Pope at once excommunicated him and his followers, but Manfred marched into the papal territory and compelled acknowledgment as master of Tuscany. Through matrimonial alliances for himself and his daughter he sought to increase his power, and his administration of the government was efficient, benign, and for a time prosperous. But the excommunication was renewed by Pope Urban IV., who also bestowed his kingdom on Charles I. of Anjou (q.v.), and a war ensued in which Manfred was finally defeated and killed at Benevento. After his death imprisonment and extreme cruelty were visited upon his widow and children.

Mangabey, măng'gạ-bā, one of the odd West African monkeys of the genus *Cercocebus*, nearly related to the guenons and to the macaques. They are distinguished by the whiteness of the eyelids and the backward growth of the hair on the crown of the head. Some of the species are well-known, especially the sooty mangabey (*C. fuliginosus*) which always carries its long tail turned over its back. There are three or four species and they make docile pets.

Mangaldán, măn-găl-dän', Philippines, a pueblo of the province of Pangasinán, Luzon, situated 12 miles northeast of Lingayén, the provincial capital. It is on the coast road, and is the meeting point of several roads extending to towns in the interior; and is on the route proposed for the railroad from Dagupan to Laoag. Pop. 16,150.

Mangalore, măng-gạ-lōr', India, a seaport town, on the Malabar coast, capital of the district of South Kanara, Madras presidency. It is clean and well built, surrounded by groves of cocoanut palms, and stands on the edge of a fine salt-water lake or back-water formed at the mouths of two rivers. The port will not admit of vessels drawing more than 10 feet of water, except in spring tides; but there is good anchorage off the mouth of the river, in 5 to 7 fathoms. The exports are principally coffee, rice, sandal-wood, cassia, and turmeric; the imports sugar, salt, and piece-goods. There is a Roman Catholic college; and the Basel Lutheran mission in India has its headquarters here. The Roman Catholics have a bishop and several churches, a considerable number of the natives belonging to this faith.

Manganese, măn-gạ-nēs', a metallic element which is widely distributed in nature, though it never occurs except in combination with other elements. The dioxid was believed to be a compound of iron until 1774, when Scheele proved it to be a compound of a previously unknown metal; and in the same year Gahn prepared the element in its metallic form. It was first called «magnesium,» from the fact that it was prepared from a compound then called «magnesia nigra» (and now known as manganese peroxid or dioxid); but in 1808 the name was arbitrarily changed to «manganese,» by Buttmann.

Manganese may be prepared in the metallic form by reducing any of its oxids with carbon at a white heat, and this is the method followed commercially. For experimental purposes, however, it is easier to obtain it by reducing the chloride with metallic sodium or magnesium. The physical properties of manganese vary somewhat according to the precise way in which the metal is obtained. Its melting-point may be taken as 3500° F., its specific gravity as 7.4, and its specific heat is 0.122. It is a gray, hard, brittle, lustrous metal, susceptible of taking a high polish, and resembling iron in most respects, both physically and chemically. It is not magnetic, however. The pure metal does not appear to be affected by dry air, but moist air oxidizes it, at least superficially. Some authorities describe it as oxidizing readily in common air, and as decomposing water with almost as great a facility as potassium; but it appears probable that the specimens from which these results were obtained contained impurities of some sort. Metallic manganese is not used in the arts, but some of its alloys with iron, aluminum and copper are valuable. It is particularly valuable in steel, its presence in small amount increasing the hardness, tenacity and elasticity of the metal. It is added to the molten steel, in the process of manufacture, in the form of an iron-manganese alloy containing from 10 to 80 per cent of the latter metal, and known in the arts as «spiegeleisen» or «ferromanganese.» The «manganese» of commerce is usually not the metal itself, but a mixture of its oxids.

Chemically, manganese is a dyad. It has the symbol Mn, and an atomic weight of 55 if $O = 16$, or 54.6 if $H = 1$. It forms numerous oxids, the best known of which are (1) the monoxid, MnO, from which the manganous salts may be prepared, and which is itself obtained by heating manganese carbonate out of contact with the air; (2) the sesquioxid, Mn_2O_3, which exists in nature as the mineral braunite, and which is also formed when the monoxid is heated in air to a red heat; (3) the red or mangano-manganic oxid, Mn_3O_4, which corresponds to the magnetic oxid of iron, does not form salts, and exists in nature as the mineral hausmannite; (4) the black oxid, or dioxid, MnO_2, which occurs in nature as pyrolusite and varvacite, and which is largely used in the arts in the preparation of oxygen and chlorine; (5) the trioxid, MnO_3, which is difficult of preparation and very unstable; and (6) the heptoxid, Mn_2O_7, a heavy, dark green liquid, prepared by treating potassium permanganate with cold concentrated sulphuric acid. Several of these oxids also occur in a hydrated form, as minerals. Of the soluble manganous salts, the chief representatives are the sulphate and the chloride. Manganous sulphate, $MnSO_4$, is prepared by treating the dioxid with sulphuric acid, oxygen being liberated at the same time in accordance with the equation $MnO_2 + H_2SO_4 = MnSO_4 + O + H_2O$. It crystallizes with five molecules of water, as a pink-colored salt, and is used dyeing and in medicine. The chloride, $MnCl_2$, crystallizes with four molecules of water, and is obtained as a by-product in the manufacture of chlorine by the action of hydrochloric acid upon manganese dioxid. It is used in calico printing. Of the insoluble manganese salts we may specially note the sulphid and the carbonate. The sulphid, MnS, is thrown down as a flesh-colored precipitate, when a soluble manganous salt is precipitated by an alkaline sulphid. The carbonate, $MnCO_3$, occurs native as the mineral rhodochrosite, and it may also be obtained as a white precipitate by adding an alkaline carbonate to a solution of manganous sulphate or chloride.

Two other important classes of manganese compounds are known, in which the manganese does not act as a base, but as an acid-forming element. These are the manganates and permanganates, which may be regarded as the salts of «manganic acid,» H_2MnO_4, and «permanganic acid,» $HMnO_4$, respectively. The potassium salts of these acids are by far the most important ones. Potassium manganate, K_2MnO_4, may be prepared by melting manganese dioxid with caustic potash and a little potassium chlorate, dissolving the bright green mass so obtained in a small quantity of water, and crystallizing by evaporation in a vacuum. Potassium manganate is used in laboratory operations, but it is very unstable, taking up oxygen with great readiness, and depositing hydrated dioxid of manganese. If the green solution containing potassium manganate be allowed to stand in the air, it absorbs oxygen, changes in color to a bright purple, and deposits hydrated manganese dioxid. The purple color is due to the presence of potassium permanganate, $KMnO_4$, which may be obtained, by crystallization, in the form of purple prismatic crystals. Potassium permanganate is a powerful oxidizing agent, and is extensively used in chemistry, in the arts, and in medicine, on account of the facility with which it parts with oxygen, especially in the presence of organic matter. It forms the basis of «Condy's fluid,» which is largely used as a disinfectant.

Manganese Bronze, a metallic element in which the copper forming the base of the alloy is mixed with a certain proportion of ferromanganese, and which has exceptional qualities in the way of strength and hardness. Various qualities are manufactured, each suited for certain special purposes. One quality, in which the zinc alloyed with the treated copper is considerably in excess of the tin, is made into rods and plates, and when simply cast is said to have a tensile strength of about 24 tons per square inch. Another quality has all the characteristics of forged steel without any of its defects. Another quality is in extensive use for toothed wheels, gearing, brackets, and all kinds of machinery supports. From its non-liability to corrosion it is largely employed in the manufacture of propellers.

Man'ganite, native hydrated oxid of manganese, $MnO(OH)$, or $Mn_2O_3.H_2O$. It crystallizes in the orthorhombic system, but also occurs in columnar and stalactitic forms. It is brittle, and has a hardness of 4 and a specific gravity of about 4.3. It is steel gray to iron black in color, and opaque with a submetallic lustre. It occurs in the Harz region, in Norway and Sweden, and in the British Isles. In the United States it is found in the Lake Superior mining district, and in Douglas County, Colo. It also occurs in Nova Scotia and New Brunswick. Manganite is used as a source of manganese for the preparation of spiegeleisen and other alloys, and also in the manufacture of pigments and dyes.

Mangasa'rian, Mangasar M., American author and lecturer: b. Constantinople, Turkey, 29 Dec. 1869. He was educated in Constantinople and at Princeton Theological Seminary, New Jersey, and has traveled and lectured widely. At the Grand Opera House, Chicago, he at present (1903) lectures weekly to the Independent Religious Society. Among the best known of his writings are: 'Omar Khayyam' (1901); 'Christian Science, a Comedy in Four

Acts’ (1903); ‘European Criticism of America’ (1903).

Mangataren, män-gä-tä'rĕn, Philippines, a pueblo of the province of Pangasinán, Luzon, 18 miles south of Lingayén; it is on the Agno River road. Pop. 10,150.

Mange, a cutaneous disease to which dogs, horses, cattle, etc., are liable. It resembles in some measure the itch in the human subject, ordinary mange being due to the presence of a burrowing parasite. Both local application and internal remedies are used in its cure. Frequent washing of the skin is essential. See ITCH.

Mangel-Wurzel. See BEET.

Mangle, a machine for smoothing linen and cotton goods. See LAUNDRY MACHINERY.

Mango, măng'gō, a genus of trees (*Mangifera*) of the order *Anacardiaceæ*. The 30 species are natives of southeastern Asia, whence some of them have been distributed by man throughout the tropics of both hemispheres. The wood of various species is used for boat and canoe making, for house building, and for boxes. It is gray, rather soft, and easily worked. The trees are valued also for shade, being of large size, attractive form and very leafy, the leaves large, leathery and evergreen. It is for their fruits, however, that they are most esteemed. These are widely used for human food especially in the East, either ripe, in which condition they are eaten raw, with or without wine, sugar and spices, or unripe as preserves, jellies, pies or pickles. They are also used for making wine and glucose. The finer varieties are considered equal to the choicest pineapples and even to the mangosteen.

The most commonly planted and most widely distributed species is the common mango (*M. indica*), a native of India. It often exceeds 40 feet in height, bears terminal panicles of rather small pinkish or yellow flowers, followed by smooth kidney-shaped yellow or reddish fruits which often weigh more than half a pound. Each fruit contains one large flattened seed, almost as long and often nearly as wide as the fruit, but flattened like the seed of a melon. The kernel is often roasted and eaten like chestnuts. The pulp of the fruit is soft, luscious in the finer varieties but very fibrous in the inferior sorts. These have a more or less pronounced flavor, suggestive of turpentine, which is characteristic of all parts of the tree. Since 1782, when the mango was introduced into Jamaica with a lot of other plants taken from a French vessel captured on its way to Haiti, the fruit has spread throughout the West Indies and southern Florida. In Florida, however, the freeze of 1886 destroyed all trees except those in the extreme southern part, where the mango is now confined. The market, which seems to be growing but is somewhat limited because of the prevailing ignorance regarding the fruit, is supplied mainly from the West Indies. California supplies little more than its home markets. The trees do best upon well drained sandy land, and should be well supplied with potassic manures. They quickly fail to bear upon wet soils. They may be propagated by grafting, but since a large proportion of the varieties reproduce practically without change by seedage, this method is widely employed.

Several other species of mangoes are cultivated. For instance, the horse mango (*M. fœtida*), a native of Malacca, is cultivated in India, and *M. sylvatica*, whose fruits are dried and used like prunes.

Mango-bird. Several birds are called mango-birds in various parts of the world because they frequent mango-trees. The East Indian one is an oriole (*Oriolus kundoo*); the West Indian one, so called in Jamaica, is a humming-bird (*Lampornis violacauda*), which may occasionally visit Florida.

Mango-fish, one of the threadfins (q.v.), a small perch-like sea-fish (*Polynemus plebijus*) which is numerous along Oriental coasts, and approaches the shore and is caught at the time when mangoes ripen. The same name is sometimes given to a relative in the West Indies (*Polydactylus virginicus*), called barbudo in the Cuban markets.

Mangosteen, the fruit of an East Indian tree (*Garcinia mangostana*) of the order *Guttiferæ*, which contains many Oriental trees of useful properties. The mangosteen resembles an orange in size and in the wedge-like segments of its interior; in color its thick rind is reddish brown, and the cool juicy pulp is esteemed as among the most delicious of Oriental fruits. The tree grows to a height of 20 to 30 feet, has large, thick shining leaves, bears large deep-red four-petaled flowers, and is largely cultivated throughout the East. The group contains some 40 African and Oriental trees, which furnish astringent medicinal bark, etc., the oily material called kokum-butter (from *G. indica*), and the pigment-gum called gamboge (q.v.).

Mangrove, măng'grōv, a genus of trees and shrubs (*Rhizophora*) of the natural order *Rhizophoraceæ*. The species, of which there are less than half a dozen, are all natives of the tropics, where they inhabit tidal marshes and the mouths of streams. They are remarkable for their aërial roots, which extend from the branches to the mud and then become trunks for the extension of the trees which gradually advance even to low tidal mark; and also for their peculiar method of seed germination, the seeds sprouting while still attached to the twigs. The wood, which in some species is close-grained and durable, is used for fuel and to a small extent for other purposes; the bark, which is rich in tannic acid, is employed in tanning; the fruit of some species is edible and is used for wine making. The trees are important soil builders, their numerous roots serving to catch debris and by checking the current enhance the settling of mud from the water. Hundreds of acres of arable land have thus been formed in Florida, and the Keys where mangrove groves are very common. The best known species is *R. mangle*.

Mangrove Hen, a West Indian clapper-rail (*Rallus longirostris*), which seeks its food in the mangrove swamps.

Mangrove Snapper, the gray snapper, an excellent food-fish, which abounds among the mangroves along the coasts of Florida and the Bahamas, and thence to Brazil. See SNAPPER.

Manguangas, män-gwän'gäs, a collective name for a number of heathen tribes living in the forests of the island of Mindanao, Philippines. They are of the Malay race. See PHILIPPINE ISLANDS.

Manguianes, măn-gē-änz', the natives of the interior of Mindoro, Romblon and Tablas (qq.v.), Philippines; they are divided into four branches, one of which is of Negrito blood, another is Mongoloid, and the other two are of the Malayan race. There are several tribes, including the Bangot, the Buquil, etc. The term is also used in the island of Palawan to designate all wild natives of unknown origin.

Mangum, măng'gŭm, **Willie Person,** American legislator: b. Orange County, N. C., 1792; d. Red Mountain, N. C., 14 Sept. 1861. He was graduated from the University of North Carolina in 1815, was admitted to the bar in 1817, in 1818 was a member from Orange County of the lower house of the State legislature, and in 1819 became a judge of the superior court. From 1 Dec. 1823 to 18 March 1826 he was a Whig representative in the 18th and 19th Congresses; but this post he resigned, and again he was elected a judge of the superior court. He retired from the court in 1826, but filled the office a third time in 1828–30. He was a United States senator from 5 Dec. 1831 to 1836, when he resigned, and from 9 Dec. 1840 to 3 March 1853; and in 1842–5 was president *pro tempore* of the Senate. Throughout nearly his entire term of service in Congress he was a leader of the Whigs; and in 1837 he received the 11 electoral votes from South Carolina for the presidency of the United States.

Manhat'tan, one of the boroughs comprising the city of New York. See New York City.

Manhattan, Kan., city, county-seat of Riley County; on the Kansas River, at the junction of the Big Blue, and on the Chicago, R. I. & P. and the Union P. R.R.'s; about 55 miles west of Topeka. The surrounding region is mainly agricultural; limestone quarries are in the vicinity. The chief industrial establishments are a foundry, machine shops, flour mills, lumber and brick yards. Manhattan is the trade centre for a large section and ships live-stock, grain, and limestone. The city owns and operates the waterworks. Pop. (1910) 5,722.

Manhattan College, an institution in Manhattan borough of New York city directed by the Christian Brothers. It was opened originally (1849) as an academy for young men, under the name of the Academy of the Holy Name, but the constant increase of the student body and the consequent demand for higher branches of study forced the academy to adopt the college courses, which was done in 1853, the academy being then incorporated under the name of Manhattan College. The courses lead to the degrees of B.A., M.A., B.S., and C.E. The resources of the college are derived from tuition only, there being no endowment. The institution reported at the end of 1910: professors and instructors, 25; students 275; volumes in library, 9,459; value of grounds and buildings, $625,000; income, $47,000; number of graduates, 932.

Manhattan Island. See New York City.

Mani, mä'nē, the founder of the sect of Manichæans. See Manichæans.

Man'ia. See Insanity.

Manicaland, mä-nē'ka-lănd, South Africa, a portion of southern Rhodesia, situated on the border of Portuguese East Africa, east of Mashonaland, between the parallels of 18° and 21° S., and the meridians of 31° 30' and 33° E. It has an area of some 10,000 square miles, generally fertile, and is traversed by the railroad from Beira to Fort Salisbury. The river Sabi flows southward through Manicaland, and on the eastern side there are mountains of considerable height. Gold is found in the neighborhood of the chief town, New Umtali. The boundary between British and Portuguese territory in this district was finally settled in 1892 after some trouble.

Manichæans, măn-ĭ-kē'anz, the followers of Manes, Mani, or Manichæus, as he is variously styled, a Gnostic teacher, whose opinions prevailed in Western Asia and Eastern Europe during the 4th and 5th centuries of our era. Manichæism is generally considered to be the Persian type of gnosis, as it is distinguished by Zoroastrian dualism, and other features of that system. Hebrew elements of religion and Buddhistic doctrines were also found in Manichæism, which appears to have been an electic jumble of wild fancies, among which the soberest and strongest dogmas of the Christian creed were sometimes seen to be embedded. The dualism of Manes was conceived of by him as manifested in two contiguous realms of light and darkness, good and evil. The kingdom of light included a heaven and an earth, the latter guarded by æons, or good spirits, and presided over by a spirit of goodness. From the kingdom of darkness sprang Satan and his evil angels. This confusion and mixture, in the universe, of light and darkness, originated before the creation of man, a creature of light and darkness combined in proportions varying in each individual. The human race is finally to be purged of darkness and sin. Jesus Christ was looked upon as dual in nature; there was Jesus who did not and could not suffer, *Jesus impatibilis,* a sort of phantom or immaterial personage, and *Jesus patibilis,* who suffered death upon the cross.

The practical side of Manichæism appears in the condemnation of marriage, or sexual indulgence of any sort, and the ascetic purification of hands, mouth, or bosom, which kept the initiated from eating animal food, contracting ceremonial defilement through the touch and indulging the flame of human passion in the heart. There were two classes of disciples, the initiated, or *perfecti,* and the *auditores,* hearers, or novices. St. Augustine of Hippo was, for nine years before his conversion to Christianity, a Manichæan hearer. These hearers lived a much less strict life than the perfecti, and constituted by far the majority of the Manichæan sect. The clergy of this sect were organized after the model of the Christian ministry; their rite of baptism was performed with oil instead of water; they had also a eucharistic meal among their public ceremonies. The system spread rapidly through the Roman empire and competed with Neo-Platonism in hostility to the Church. Diocletian persecuted the Manichæans, and under Justinian the profession of Manichæism was a capital crime. The system, however, flourished in Asia beyond the 10th century and has reappeared in some shape or other, and under different names at different times in subsequent periods of European history. Consult: Routh, 'Acta Disputationis Archelai' (1848); Eusebius, 'Ecclesiastical History'; De Beausobre, 'Histoire critique du Manichéisme' (1734); and Harnack, 'History of Dogma' (1897).

Manifes'to, in international law, a declaration publicly issued at the commencement of a war by the contending powers to show the causes which justify such a measure. Manifestoes are in the form of public letters; they commence with a short address to the public in general, and are signed with the name of the person who issues them. See LAW, INTERNATIONAL.

Manifolds, Theory of. See ASSEMBLAGES, GENERAL THEORY OF.

Man'ĭgault, Arthur Middleton, American soldier: b. Charleston, S. C., October 1824; d. 16 Aug. 1886. In 1846 he was elected 1st lieutenant of the Charleston company in the «Palmetto» regiment for the Mexican War, throughout which he served. In June 1861 he was elected colonel of the 10th regiment, South Carolina infantry, and in 1861–2 was in command of the 1st South Carolina military district. From the early part of 1862 he served in the army of the West successively under Bragg, Johnston, and Hood, in 1862 was placed in command of a brigade, and in 1863 made brigadier-general. At Chickamauga he distinguished himself by his repeated assaults, and in the retreat before Sherman's invasion he did some vigorous fighting. His death was hastened by a wound received in the battle of Franklin, Tenn. (30 Nov. 1864). Subsequent to the war he was elected by the Democrats adjutant-general of South Carolina, served by two re-elections until his death, and at that time was a candidate for a fourth term.

Man'ĭhot. See CASSAVA.

Manila, mạ-nĭl'ạ or mä-nē'lā, the capital of the Philippine Islands, the principal city of Luzon as well as of the archipelago, situated in lat. 14° 35′ 31″ N. by lon. 120° 58′ 08″ E., lies on both sides of the Pasig River, and has a frontage of four miles on the bay of Manila. The corporate jurisdiction for police purposes extends three miles from the shore over Manila Bay, making the total area under the police jurisdiction of the city 32 square miles or 20 square miles on land, and 12 on the bay. The name of the city is a corrupt form of a Tagalog word, originally written «Maynila,» and means a species of shrub or bush which formerly grew on the site of the city. It is now applied not merely to the town within the walls, but to the whole region and the inhabitants included within the corporate limits. The most important divisions of the city are the walled town, particularly known as Manila, on the left bank of the river and Binondo on the right bank. Other districts, formerly more independent than at present, have retained their names and some degree of individuality. Immediately south of the walled town lies Ermita; farther on along the shore is Malate; and inland directly east of these lie Paco, Pandacan, and Santa Ana. The most northern district on the shore of the bay is Tondo, and between this district and the lower part and mouth of the river lies San Nicolas. The other districts north of the Pasig are Quiapo, San Miguel, Sampaloc, Santa Cruz, and Trozo.

The walled town was occupied chiefly by the members of the Spanish colony. Its streets are straight and run at right angles with one another, dividing the area within the wall into 54 blocks. The buildings have usually two stories, and are built like the houses of Spanish cities. It contains the cathedral, the principal religious houses and churches of the ecclesiastical orders, various schools, the University of St. Thomas, the hospital of San Juan de Dios, the mint, and the new city hall. This building was started by the Cosmopolitan Hospital Association in 1901 but owing to lack of funds remained uncompleted and was purchased and completed by the city authorities The cathedral is an imposing building.

The north wall of the town extends along the bank of the Pasig. Around the outside of the rest of the wall, runs a moat receiving water from the river just east of the town and emptying into the river just west of it. Until 1852 the drawbridges across the moat at the several gates were raised every evening at 11 o'clock, and lowered in the morning at 4. Since then it has not been customary to close the gates.

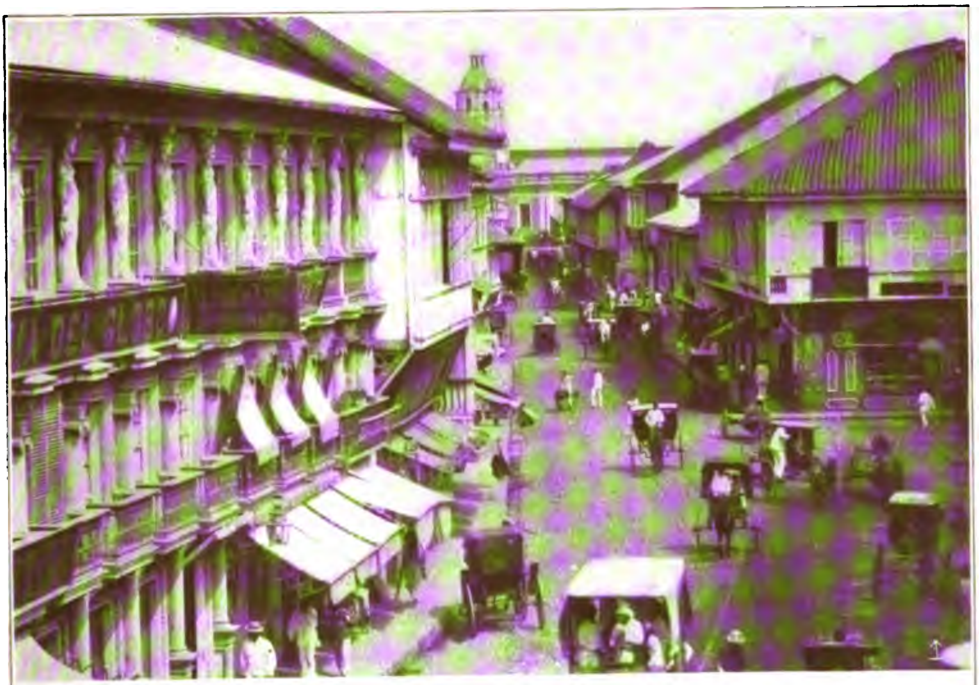
Only a few of the streets of Manila, of which there are about 80 miles, are paved. The rest are macadamized. European and American retail shops occupy the Escolta, in Binondo. The street called Rosario is almost entirely given up to Chinese shops. The wholesale houses and the banks occupy the district north of the Pasig and west of the Bridge of Spain.

Miguel Lopez de Legaspi established Spanish authority at Manila in 1571, by a treaty with Lacandola, Rajah of Maynila, which was confirmed by the compact of blood made between the contracting parties. On 3 June 1571, he conferred upon Manila the title of «distinguished and ever loyal city.» This title was subsequently confirmed by royal decree. He also gave the city a municipal organization, by appointing two *alcaldes,* one *aguacil mayor,* and twelve *regidores.* He also appointed one notary for the *cabildo,* or corporation, and two notaries public for the court of the alcaldes. Later there were only eight regidores, but in addition a registrar and a constable. The alcaldes were justices, and were elected annually from the householders by the corporation. The regidores were aldermen and with the registrar and constable held office permanently as a proprietary right. The permanent positions in the cabildo could be bought and sold or inherited. This form of organization was maintained throughout the Spanish period.

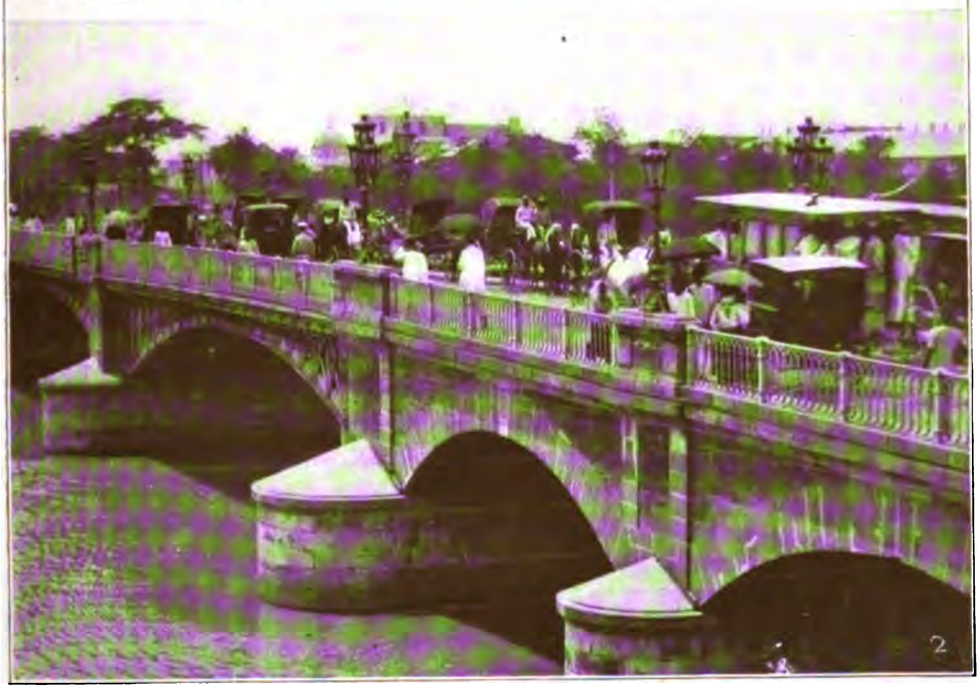
In 1578 the church and all the inhabitants of Manila were separated from the jurisdiction of the archbishop of Mexico, and the church was erected into a cathedral, but the new bishop was subject to the archbishop of Mexico. On account of the long time needed to communicate between Spain and the Philippines the king ordered the governor of the islands to fill vacancies in the cathedral whenever they might occur.

As early as the beginning of the 17th century the city of Manila was surrounded by a wall of hewn stone about three miles in circuit. It contained a college conducted by the Jesuits, a school for girls called the Santa Potenciana, two hospitals, one for Spaniards and one for Filipinos, a house of mercy for receiving sick slaves and furnishing lodgings to poor women, and a hospital for Chinese. At this time there

MANILA.



1. La Escolta.



2. The Bridge of Spain.

were within the walls about 600 houses built of stone and mostly occupied by Spaniards. There were also about 2,000 Chinese, with 200 shops, and a garrison of 200 soldiers.

In the war between England and Spain, in 1762, Vice Admiral Samuel Cornish was ordered to proceed against Manila. He carried British and Sepoy forces under Sir William Draper. On 6 Oct. 1762 Archbishop Rajo, as acting governor, surrendered the city, agreeing to pay the British an indemnity of $4,000,000. Only a part of this was paid. The affairs of Manila were administered by the British military authorities until 10 Feb. 1763. After this Manila remained uninterruptedly under the control of the Spanish until 13 Aug. 1898, when it was surrendered to the authorities of the United States. On 20 August the military government opened the custom-house for business, continuing in force the Spanish tariff and customs regulations. In 1899 the Filipinos in insurrection made several attempts to destroy the city. The attempts on 4 and 22 February resulted disastrously to the insurrectos. A similar undertaking was planned for the occasion of General Lawton's funeral.

The political relation of Manila to the central government of the islands is not greatly unlike that which Washington holds to the Federal government of the United States. The city was incorporated by an act passed by the United States Philippine Commission on 31 July 1901. The government is vested in a municipal board of five members appointed by the civil governor, with the advice and consent of the Commission. The municipal board has certain legislative and executive authority. The organic act provides also for a secretary and other officers, and prescribes their powers and duties. Appropriations for city purposes are made by the Commission on estimates submitted by the board. Thirty per cent of the expenses of the city are paid by the central government, and the balance is met by funds derived from city taxes. All moneys collected in the city are paid into the Insular Treasury, and are there subject to appropriation by the Commission. The estimated revenues for 1907 were 3,857,142.85 pesos and the expenditures 3,692,884.74 pesos.

Vessels approaching Manila by sea from the northwest first sight the Capones Grande light off the southwest coast of Zambales. Vessels from the ports of Indo-China first sight the Corregidor light in the centre. Vessels from Singapore, Java, India, Borneo, and all the southern ports of the Philippine Islands sight the Cabra Island light. All converge on the Corregidor light at the entrance of the bay.

The inhabitants of Manila number 219,941, consisting of 189,782 Filipinos, 21,230 Chinese, 2,528 Spaniards, 1,117 Europeans, 895 of other nationalities and 4,389 Americans.

A new water supply system is now under construction. A section of the Mariquina River about 16 miles above Santolan is being converted by means of a dam into a reservoir of 2,000,000,000 gallons capacity. One mile distant from the San Juan deposits, at a point 112 feet above sea level, a 50,000,000 gallon reservoir is being constructed and from this the water will be distributed to the city. The present reservoir of 16,000,000 gallons capacity will remain as a reserve deposit. The waterworks are owned by the city. The estimated valuation of taxable real estate in 1906 was 80,525,235 pesos.

The Luneta is an elliptical drive and promenade on the shore of the bay between the city wall and the houses of Ermita. It has been greatly enlarged by the American government, and it has ceased to be a place for public executions. A military band gives a concert here nearly every evening.

Among the statues adorning public places the most noteworthy are that of Charles IV. in the square in front of the "Palace" or Ayuntamiento building, that of Isabella II. in the plaza of Malate, and that of Legaspi and Urdaneta near the Luneta. Other monuments are the Magellan column standing on the south bank of the river just below the Bridge of Spain, and the Anda monument on the same bank of the river at the end of the Malacon drive, which runs between the western wall and the shore of the bay. There are numerous bridges in the city, including the stone arch bridges over the Paci-Estero and the Estero de Quiapo, the Palomar and Azcarraga bridges, the Bridge of Spain, the reinforced concrete arch bridge over the San Miguel Estero, a steel lift bridge over the Estero Binondo at the fort of Calle Soledad, and the Ayala bridge.

Among the noteworthy establishments or institutions in the city are the civil hospital, the hospitals of San Lazaro and San Juan de Dios, the trade school, the normal school, the public library, the government laboratories, the government printing office, and the government cold storage and ice plant.

BERNARD MOSES,
University of California.

Manila Bay, the largest bay in the Philippine archipelago, indenting the western central coast of the island of Luzon. Its greatest dimensions are from Tutubatu Island in the northwest to Las Pinas on the southeastern shore, 35 miles, and from the delta of the Grande de la Pampanga River southwest to Corregidor Island, 31 miles; circumference 120 miles. The entrance from Pulo Munti Point to Restinga Point is 12½ miles and is divided into two channels by the islands of Corregidor and Pulo Cabello. The bay is surrounded by five provinces, and receives the waters of many rivers, including the Grande de la Pampanga, with its large delta, and the Pasig at Manila. The lands on both sides of the bay at the entrance are high and covered with vegetation, but the shores at the head of the bay are low and marshy, intersected by numerous small rivers, estuaries, and tidal lakes. It is one of the finest harbors in the East, being free of obstructions to navigation, and affording excellent anchorage. Manila, the capital of the archipelago, and Cavite, the United States naval headquarters in the Philippines, are on its shores; an artificial port is being constructed at Manila. In this bay Admiral Dewey won a victory over the Spanish fleet 1 May 1898.

Manila Bay, Battle of. See SPANISH-AMERICAN WAR.

Manila Hemp, or Abaca, *Musa textilis.* This species belongs to the plantain or banana family, the commercial fibre being derived from the stalk or trunk of the wild plantain of the Philippine Islands, and is classed as a structural fibre. The strongest and best of our hard cordage fibres, it is employed in the United States for standard binder twine, and for all sizes of rope from the smallest dimensions to hawsers and cables. The old rope and the waste are employed as paper stock. The fibre is creamy white to reddish white, lustrous, easily separated, stiff and resistant, while its lightness makes it advantageous for employment in cordage for the rigging and running ropes of ships. Structurally the bundles of fibres are very large, but easily separated into fibres of even diameter; the walls of the cells are of uniform thickness, growing slender toward the ends gradually and regularly. In breakage tests for textile strength, with English hemp — made by the British government — Manila stood a strain of 4,669 pounds against 3,885 pounds for hemp, ropes 3¼ inches in circumference and 2 fathoms long being used in each test. In the Philippine Islands the finer grades of the fibre are extensively used for fabric manufacture, the product being worn by the natives of both sexes throughout the archipelago. Mixed with cotton a durable fabric is produced well adapted to the climatic conditions of the islands. According to a recent report of the Philippine Bureau of Agriculture, the manila hemp plant was introduced into India in 1859, and the Andaman Islands in 1873. The plant is also said to be found in Borneo and Java, and attempts have been made to introduce it into other countries. It remains a fact, however, that the commercial fibre is produced only in the Philippines. The culture has been attempted without success in the West Indies, and seed was imported for trial in Florida only a few years ago, by the writer, but it failed to germinate. Several species of banana yielding fair fibre are successfully cultivated throughout tropical and sub-tropical America, and in many other portions of the world. Banana fibre bears no comparison, however, with the Manila hemp of commerce, although the fibre of *Musa basjos* is produced commercially in Japan where it is employed for undergarments for summer wear, as well as for light dresses for the higher classes of Japanese.

Manila hemp first attracted attention commercially early in the last century, and was imported into Salem, and Boston, Mass., about 1824; samples of the fibre, however, were brought to this country by naval officers as early as 1820. The production of the textile had reached about 8,000 tons in 1840, 30,000 tons in 1860, and 50,000 tons in 1880. In 1900 the production was nearly 90,000 tons, and at the present time represents over 62 per cent of the Philippine exports. The United States consumed last year 56,455 tons of the fibre, valued at $10,558,381.

Regarding the specific localities of production and details of cultivation, preparation, etc., the student is referred to Bulletin of the Royal Gardens Kew (August 1894), to a Descriptive Catalogue of Useful Fibre Plants of the World (Washington 1897), and to Farmer's Bulletin (No. 4, pub. 1903), by the Philippine Bureau of Agriculture, Manila.

The extraction of the fibre is a simple proposition. The *abaca* is cut near the roots when the plant is two to four years old, and just before blossoming; if cut earlier the fibre is finer but shorter. After striking off the leaves the trunk or stem is slit from end to end, and the sheathing layers of cellular matter, which form the petioles of the leaves are separated, dried a day or two and then cut into strips three inches wide, and finally scraped until the fibre has been cleaned of all extraneous matters, soft cellular tissue, etc. The bundles of wet fibre are shaken into filaments, washed, dried and sorted. This is the export fibre for cordage purposes, the fabric fibre necessitating further treatment by beating, which softens and subdivides the filaments. The export fibre is wrought into hanks and made into bales of about 270 pounds, when it is ready for shipment. Attempts to use machinery for extracting the fibre have not been successful, partly because the machines have not been adequate, and partly on account of native prejudice. There is great waste by the hand methods of preparation which it is thought machine extraction would obviate. See FIBRE; HEMP; JUTE; RAMIE; SISAL.

CHAS. RICHARDS DODGE.

Manila, University of, founded in 1585 by Philip II. of Spain. Later branches or affiliated schools were founded in different parts of the island. A seminary for the sons of Spanish nobles was opened in 1601, and 10 years later departments were added for the sons of those not belonging to the nobility and for the natives. The university was reorganized in 1857. The departments are science, classics, law, medicine, theology, philosophy, pharmacy, arts and music. The usual degrees are granted. In 1910 there were over 1,200 students in attendance.

Manin, mä-nēn', **Daniele,** Italian patriot: b. Venice 13 May 1804; d. Paris 22 Sept. 1857. He studied at the University of Padua, was admitted to the doctorate of laws, and practised at the bar. In politics he became the leader of the liberal class, and by 1847 had secured a solid reputation as a political economist. For anti-Austrian utterances made during that year and the next he was twice imprisoned, but while awaiting trial was set free by the populace upon arrival of news of the revolution of 1848 in Italy and France, was made President of the Republic of Saint Mark, and given supreme power as head of the patriotic revolt. The Austrians were driven out, and during the siege, which began in the autumn of 1848 and lasted 12 months, Manin was at the head of the civil government, and to his counsels and patriotic spirit it was mainly owing that the Venetians maintained so long and brilliant a defense. After the capitulation Manin retired to Paris, where he maintained himself by giving lessons in Italian, and continued in various pamphlets and through the press to advocate the cause of Italian independence. Consult Martin, 'Daniel Manin and Venice in 1848–9.'

Ma'nioc, or **Mandioc.** See CASSAVA.

Man'iple, (1) one of the divisions of the ancient Roman army. It consisted of 60 rank and file, two officers called centuriones, and one standard-bearer called vexillarius. (2) In the Roman Catholic ritual a sacred vestment attached to the left arm, to leave the right at liberty for ministering.

Manipur, măn-ĭ-poor', northeast India, a native state consisting principally of an extensive valley situated in the heart of the mountainous country which lies between Assam, Cachar, Burma, and Chittagong; area, 8,300 square miles. The greater part of the state is covered with forest and jungle, and the wild animals include the elephant, rhinoceros, tiger, leopard, bear, deer and buffalo. The people belong to the Mongolain race. They are governed by a rajah, at whose court resides a British political agent under the control of the chief commissioner of Assam. The capital is Manipur; pop. about 68,000. Most of the work is done by the Manipuri women, the men being lazy. The chief crop is rice. There is a special breed of ponies in the country, which are much employed in the game of polo, the national sport of Manipur. There has been a political agent in Manipur since 1835. In 1891, in an outbreak headed by a member of the reigning family, the chief commissioner of Assam and the political agent were murdered; but the disturbance was soon put down and avenged. Pop. about 290,000.

Ma'nis, Pangolin, or **Scaly Ant-eater,** an edentate mammal, belonging to the group *Squamata,* co-extensive with which is the family *Manidæ*. The body and long, thick tail are covered with horny, imbricated scales. The legs are short and very strong, and the toes are armed with powerful claws, enabling the animals to burrow rapidly. These animals can roll themselves into a ball, and are then protected by their scales, and they exhibit remarkable strength in holding their bodies in this protective attitude. The scales are regarded as formed of agglutinated hairs; and in the Asiatic species true hairs grow between the scales and extend beyond them. All dwell in burrows, come abroad only at night and subsist almost altogether on ants and termites, which they capture by means of their long, rope-like, sticky tongues. They have no trace of teeth; and in general structure show a close resemblance to the American ant-eaters. The latest review of the family shows that it contains seven species.

Manistee, măn-ĭs-tēe', Mich., city, county-seat of Manistee County, on Lake Michigan, and the Manistee River, and on the Manistee & North-Eastern, the Pere Marquette, Manistee & Luther and Manistee & Grand Rapids R.R.'s.

History.— Its name is derived from the river which passes through it, the Indian interpretation of which is "The Spirit of the Woods." The Chippewas, and portions of the Tawas and Ottawa tribes, inhabited this region when in its primitive state. A mission house is said to have been built here in the year 1826, but not until 1830, have we positive proof of the white man's presence, when a party of white men landed and proceeded up the river. In 1840, John and Joseph Stronach, coasting along the east shore of Lake Michigan, in a sail boat, landed here, and were so favorably impressed that they selected a site for a saw mill in the dense pine forest and the following spring John Stronach and his son Adam chartered a schooner, and came here with machinery, supplies, and about 15 men. They arrived at the mouth of the river 16 April 1841. From that day dates the first permanent settlement of Manistee County. There were at that time about 1,000 Indians here, and soon after a reservation was set apart for them, the government allowing all the land Chief Kewaxicum desired. The territory selected extended six miles north and south, and 22 miles east and west, embracing the valley of the Manistee River. In 1848 a mill at the mouth of the river was built by John Canfield, and for several years thereafter business had a tendency to settle west of what is known as "the big sand-hill." In 1849 the Indian reservation was taken up by treaty, and the tribal relations of the Indians broken up, although an Indian settlement remained for many years at Eastlake, and one on the point of land projecting into Manistee Lake, near the east end of River street. In 1855, by the passage of a bill in the Legislature, Manistee County became organized, having the townships of Stronach, Brown and Manistee, and at the first county election 136 votes were cast. In 1861 Manistee's population numbered but 1,000 persons, and between the Civil War and a disastrous fire its progress was greatly retarded. After the close of the war, things became more prosperous. In 1869 the town outgrew itself and became a city, with 3,343 inhabitants. Manistee was again visited by fire, 8 Oct. 1871, and almost entirely destroyed, but with great energy the citizens began the work of reconstruction, which resulted in the Manistee of today. Its western confines are bounded by Lake Michigan. On the southeast is Lake Manistee, five miles in length and 1½ miles wide. Passing through the centre of the city, a distance of 1½ miles, and uniting the two lakes, is Manistee River, 175 feet wide with a minimum depth of 12½ feet, and a current running about four miles an hour. Its waters, never closed by ice, are navigable the entire year, making the best winter harbor on Lake Michigan.

Industries, Etc.— With the exception of Chicago and Milwaukee, Manistee is the largest shipping port on Lake Michigan. The total number of vessels entered and cleared from this port in 1911 was 794, and their combined registered tonnage was 433,400. Of this there were 167,138 tons of salt and 57,800,736 feet of lumber, besides the large quantities of both that were shipped by rail. Manistee's chief industries are the manufacture of salt and lumber. Underlying here at a depth of more than 1,900 feet is a strata of rock salt 32 feet in depth, and from wells 2,000 feet deep, with an opening of but six inches in diameter, is pumped brine, from which immense quantities of salt are manufactured. About two and one-half million barrels of salt are shipped from here annually. The Buckley & Douglas Salt block is the largest under one roof in the world. Two lines of passenger steamers connect the city with Chicago, Milwaukee, and points north and south. There are two telegraph lines, a telephone exchange, the Holly system of waterworks, with 28 miles of mains, 8 miles of electric street railway, over 42 miles of streets, two daily papers, and three weeklies, one of which is printed in German.

Education.— There are six modern and well equipped public school buildings, and six parish schools, a Carnegie library, 16 churches and one mission.

Parks.— Orchard Beach, situated 2½ miles north of the city, is one of Manistee's chief beauty spots. Among the attractions of this park is a theatre 70x102 feet, which seats comfortably about 700 persons. Reitz Park is on a high bluff overlooking Lake Manistee.

Suburbs.— Situated on Lake Manistee are Oak Hill, Filer City, Stronach, Eastlake, and Parkdale. The Vacuum Pan Salt Works at

Eastlake are the largest in the world. Population of Manistee is 12,381, including suburbs, 18,073.

MRS. EDWARD D. WHEELER.

Manistique, măn-ĭs-tēk', Mich., city, county-seat of Schoolcraft County; on Lake Michigan, at the mouth of the Manistique River, and on the Manistique & N. and the Minneapolis, St. P. and S. Ste. M. R.R.'s; about 70 miles southeast of Marquette. It is in the vicinity of the forests which furnish considerable of the marketable lumber. Iron ore and limestone are abundant in this region. The chief manufacturing establishments are foundries, lime-kilns, lumber mills, chemical works, and distilleries. Charcoal is one of the important products made just outside the city, and fishing is a prominent industry. The opportunities for trade are excellent, and Manistique is a commercial centre for a large portion of the southeastern part of the Upper Peninsula. The city has good public and parish schools and a public library established in 1894. Pop. 4,400.

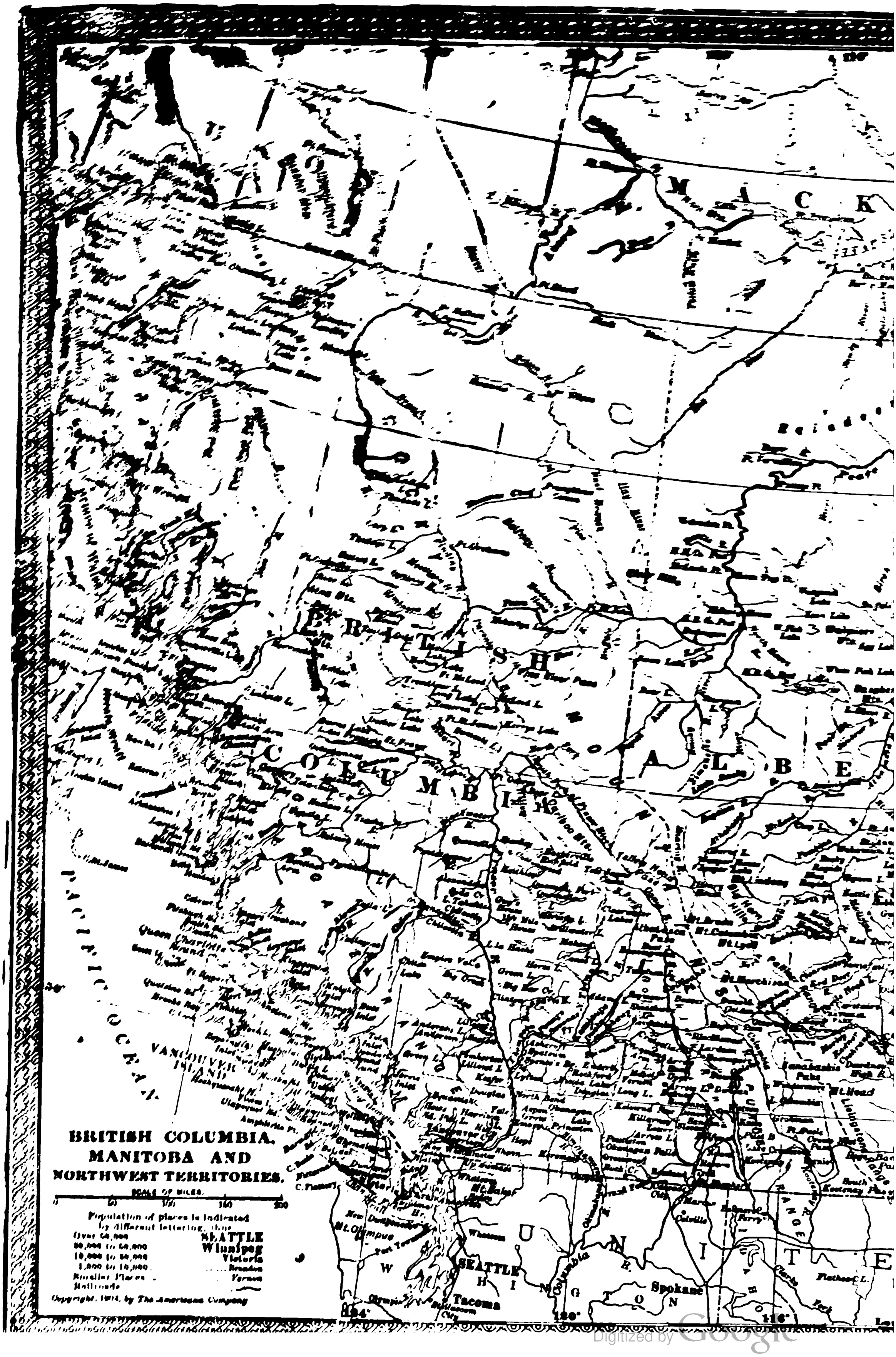
Manitoba, Canada, the central province of the Dominion, begins near lon. 95° W. — on the international boundary line, and from 1870 until 1912 extended to 101½° W. — a distance of 276 miles. It reached north from the boundary line for 264 miles with an area of 73,732 miles. The water surface contained in its inland fresh water lakes was computed at 9,890 square miles. In 1912, after years of political discussion and effort to have the boundaries extended north to Hudson's Bay, this result was achieved with an estimated total area of 251,832 square miles; the possession of a seaport upon the Bay toward which a Dominion-built railway was steadily progressing; the acquisition in these 178,000 square miles of a territory rich in great rivers, unsurveyed but partially known resources of minerals, forests, furs, fisheries and water-powers. Pop. (1881) 62,260; (1891) 152,506; (1901) 255,211; (1911) 455,614. The capital is Winnipeg (q.v.), lying almost equally distant from the Atlantic and Pacific oceans. The city (1911) contained a population of 135,440, by the civic census, 166,553. Other centres are (1) Brandon, pop. 13,839; (2) Portage La Prairie, pop. 5,892; (3) St. Boniface, pop. 7,470. The province lies at a varying elevation of from 760 to 1,500 feet above the sea.

Topography and Geology (including soils). — The eastern part of Manitoba consists of Laurentian rocks, bare of soil, the region having been the source of supply, when worn down by glacial action, of the deposits to the west. This Archæan region stretches for seventy or eighty miles from the eastern boundary, where begins the terrane of the Red River and Assiniboine valleys, varying from 60 to 170 miles in width. The valley region is underlain by limestone deposits of the Silurian and Devonian period. On the west side of this valley extends at an elevation of from 100 to 150 feet the second prairie steppe, the eastern escarpement of which is the Pembina Mountain, Tiger Hills, Riding Mountain, and Duck Mountain. Underlying this elevated plane the rocks, largely of shale and sandstone, are of the Cretaceous period. The rocks of Manitoba contain deposits of iron, gypsum, cement, limestone for building. The Silurian, Devonian and Cretaceous rocks of Manitoba are overtopped by beds of drift or soil from 60 to 200 feet in thickness. This drift had been chiefly deposited in a series of lakes formed by the great melting ice-lobes of the glacial period. In these post-glacial lakes — Agassiz, Souris, and Saskatchewan — the drift beginning at the underlying rock is generally made up of boulders, boulder clay, blue clay, a layer of marly clay called "white mud" and on the surface a rich deposit of humus from two to four feet thick. This upper layer being well supplied with phosphates and nitrogenous components is probably the most fertile soil in North America. Manitoba is well watered by Lakes Winnipeg, Manitoba, Dauphin and Winnipegosis, and by the Red River, Assiniboine and Winnipeg, their affluents. Along the lakes and rivers, and in protected elevations, considerable areas of trees grow. These are chiefly cedar, spruce, tamarack, aspen (poplar), balsam, cottonwood, elm and oak. Indigenous fruits are the strawberry, raspberry, plum, cherry, high bush cranberry, huckleberry and wild grape. The rivers and lakes teem with fish — white fish (largely exported), cat fish, gold eyes, pike, pickerel and sturgeon. The wild life of the region is made up of moose, jumping deer, antelope, Arctic hare, rabbit, fox, prairie wolf, prairie chicken, partridge, swan, pelican, wild goose, duck, crane, snipe, and a great variety of carnivorous and insectivorous birds. The province is in consequence a famous resort of hunters. Buffalo, once numerous, are now extinct. The new provincial area has not been officially dealt with; general conditions are, however, very similar except as to soil.

Climate. — The climate in winter is cold, but dry, and though the mercury occasionally falls to 40° below zero, yet it is a pleasant winter climate. Being of a comparatively low level there are few violent storms, and the country is most healthful. The summer months are warm, the days are long, having in midsummer 18 hours of sunshine, the temperature rises at times, but there is almost continuously a slight breeze, and the nights are always cool.

Pioneer History and Development. — Prior to the efforts made by the Earl of Selkirk in the ten years following 1811 Manitoba had practically no history apart from the fur-hunting, Indian trading, records of the Hudson's Bay Company with its administration, from 1670 onwards, of regions stretching from the shores of Lake Superior to the waters of the Pacific and far into the wilds of Alaska. Up to that time Manitoba had no separate identity and was merely a part of the great and ill-defined territory known as Rupert's Land.

After studying the position of affairs in the Northwest and in Montreal Lord Selkirk made up his mind that the Hudson's Bay Company were the eventual masters of the situation and decided to throw in his lot with them. He purchased, in 1811, a controlling interest in its stock — some £40,000 out of £100,000 — and obtained from the directors, amongst whom were many of his friends or relatives, a grant of 116,000 square miles of territory on the condition that he would establish a colony and furnish the company with laborers as required. This was practically the founding of the province of Manitoba. The pioneer nobleman at once brought out a ship-load of the Duchess of Sutherland's tenants and after varied difficulties and dangers reached the junction of the



BRITISH COLUMBIA, MANITOBA AND NORTHWEST TERRITORIES.

SCALE OF MILES.
0
50
100
150
200
Population of places is indicated by different lettering, thus
Over 50,000 SEATTLE
20,000 to 50,000 Winnipeg
10,000 to 20,000 Victoria
1,000 to 10,000 ....Brandon
Smaller Places .... Vernon
Railroads

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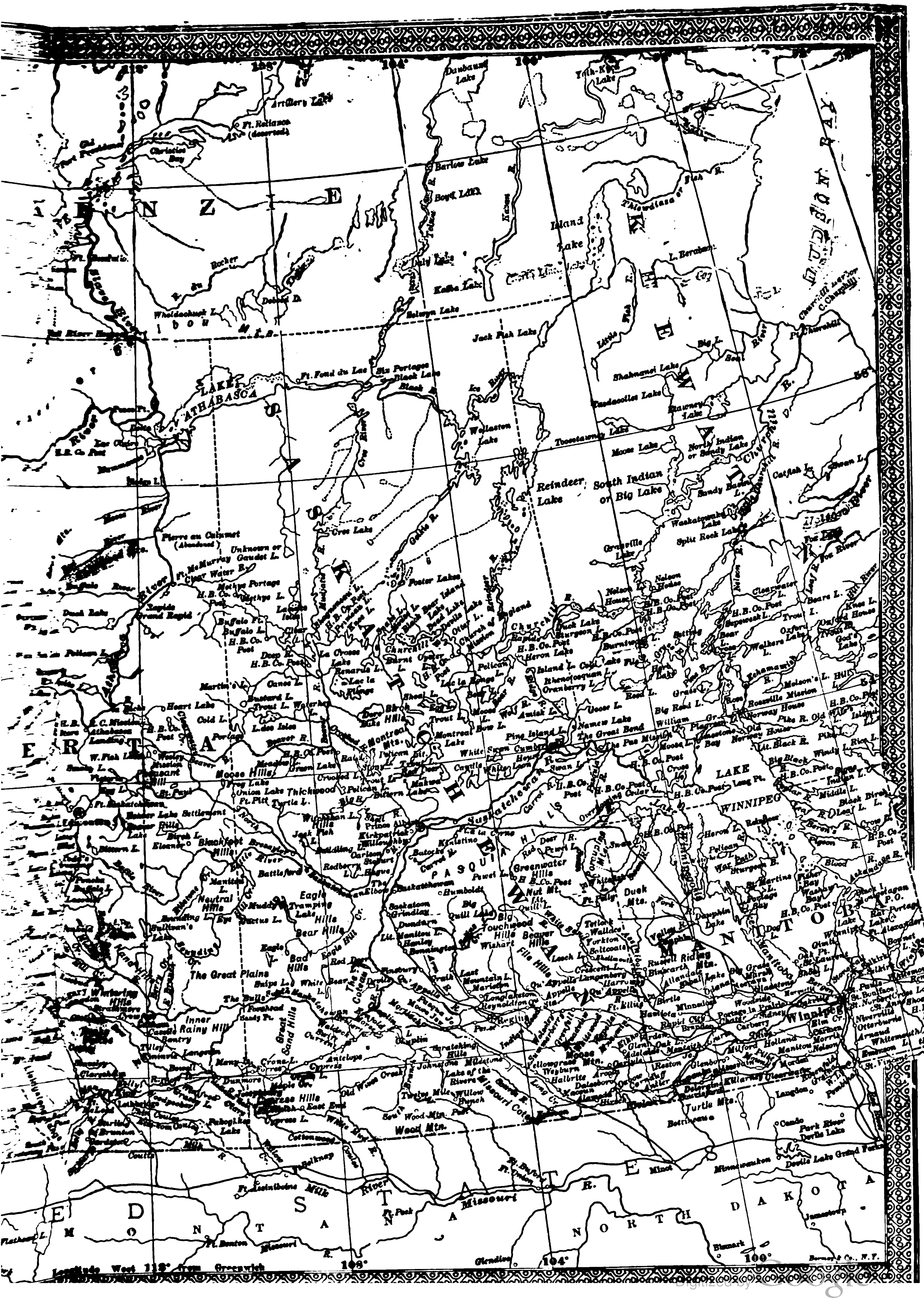
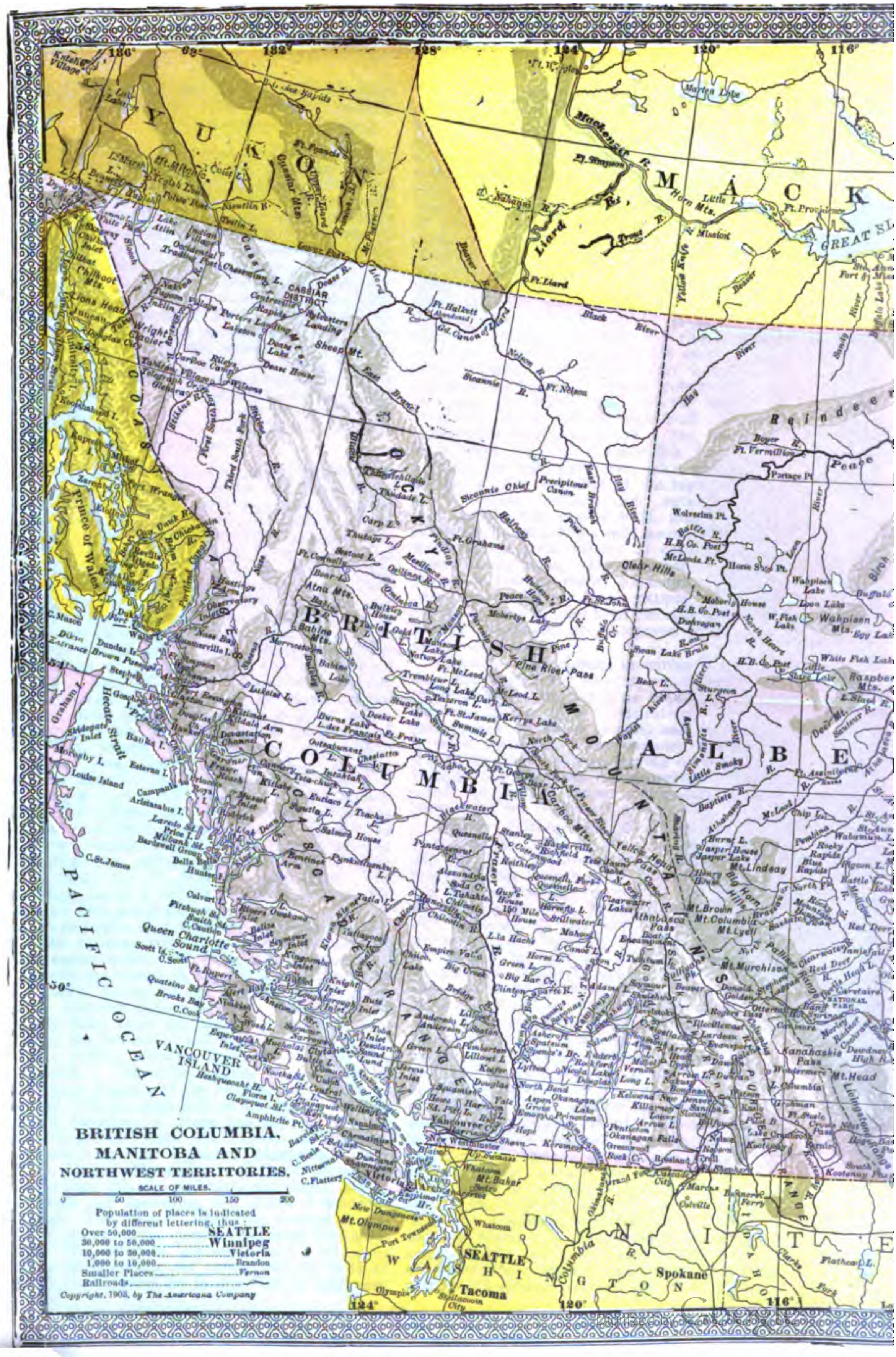


108°
104°
100°
96°
Dubawnt Lake
Yath-Kyed Lake
Artillery Lake
Ft. Reliance (deserted)
Ft. Providence
Christie Bay
Barlow Lake
Boyd Lake
Kazan R.
Island Lake
Thlewdiaza or Fish R.
L. Beraham
Daly Lake
Kasba Lake
Dubawnt R.
Dobaut R.
Wholdaehuck L.
Selwyn Lake
Jack Fish Lakes
Little Fish L.
Big L.
Seal River
Ft. Churchill
Churchill Harbor
C. Churchill
Shabanaoi Lake
Tsasdaooilea Lake
Rawney Lake
Ft. Fond du Lac
Six Portages
Black Lake
Black R.
Ice Bay
Wollaston Lake
LAKE ATHABASCA
Poplar Pt.
Fond du Lac
Tsoettawenn Lake
Moose Lake
North Indian or Sandy Lake
Catfish L.
Reindeer Lake
South Indian or Big Lake
Sandy Bank L.
Cree River
Cree Lake
Geikie R.
Waskatowaka Lake
Split Rock Lake
Granville Lake
Pierre au Calumet (Abandoned)
Unknown or Gaudet L.
Ft. McMurray
Clear Water R.
Methye Portage
Methye L.
H. B. Co. Post
Rapids
Grand Rapid
Buffalo L.
Foster Lakes
Black Bear Island
Churchill R.
Nelson House
Clearwater
Bears L.
Knee L.
Oxford House
Trout L.
God's Lake
Pelican L.
Lac la Ronge
Heart Lake
Cold L.
Beaver R.
Montreal Lake
Montreal Mts.
Cumberland
Pine Island L.
Namew Lake
The Great Bend
The Pas Mission
Norway House
Moose L.
Cross L.
LAKE WINNIPEG
Long Pt.
Moose Hills
Frog Lake
Ft. Pitt
Thickwood
Pelican L.
Turtle L.
Saskatchewan R.
Prince Albert
Carrot R.
Kinistino
Batoche
Shell R.
Duck Lake
Red Deer R.
Swan L.
Swan R.
Cedar L.
Edmonton
Ft. Saskatchewan
Victoria
St. Paul
Saddle Lake
Blackfoot Hills
Battle River
Battleford
Eagle Hills
Neutral Hills
Bear Hills
Saskatoon
Humboldt
Greenwater Hills
Touchwood Hills
Quill Lakes
Nut Mt.
Duck Mts.
Pasquia Hills
Dauphin Lake
Lake Manitoba
Lake Winnipegosis
Westbourne
Portage la Prairie
Winnipeg
St. Boniface
Selkirk
Rat Portage
Ft. Alexander
Riding Mts.
Russell
Birtle
Brandon
Minnedosa
Carberry
Yorkton
Saltcoats
Langenburg
Qu'Appelle
Qu'Appelle R.
File Hills
Fort Qu'Appelle
Regina
Moose Jaw
Long Lake
Last Mountain L.
Swift Current
Medicine Hat
Dunmore
Cypress Hills
Maple Cr.
The Great Plains
Great Sand Hills
Calgary
Wintering Hills
Lethbridge
Macleod
Wood Mtn.
Wood Mtn. Post
Moose Mtn.
Turtle Mts.
Souris R.
Estevan
Deloraine
Boissevain
Killarney
Manitou
Morden
Emerson
Pembina
Cando
Park River
Devils Lake
Grand Forks
Minot
Jamestown
Bismarck
Missouri R.
Milk River
Ft. Assinniboine
Ft. Benton
Ft. Peck
Ft. Buford
Glendive
Flathead L.
N O R T H   D A K O T A
M O N T A N A
U N I T E D   S T A T E S
M A N I T O B A
S A S K A T C H E W A N
A S S I N I B O I A
K E E W A T I N
M A C K E N Z I E
A L B E R T A
Longitude West 112° from Greenwich
Bormay & Co., N. Y.



BRITISH COLUMBIA, MANITOBA AND NORTHWEST TERRITORIES.

SCALE OF MILES.
0 50 100 150 200

Population of places is indicated by different lettering, thus:
Over 50,000 .... SEATTLE
30,000 to 50,000 .... Winnipeg
10,000 to 30,000 .... Victoria
1,000 to 10,000 .... Brandon
Smaller Places .... *Vernon*
Railroads .... ～

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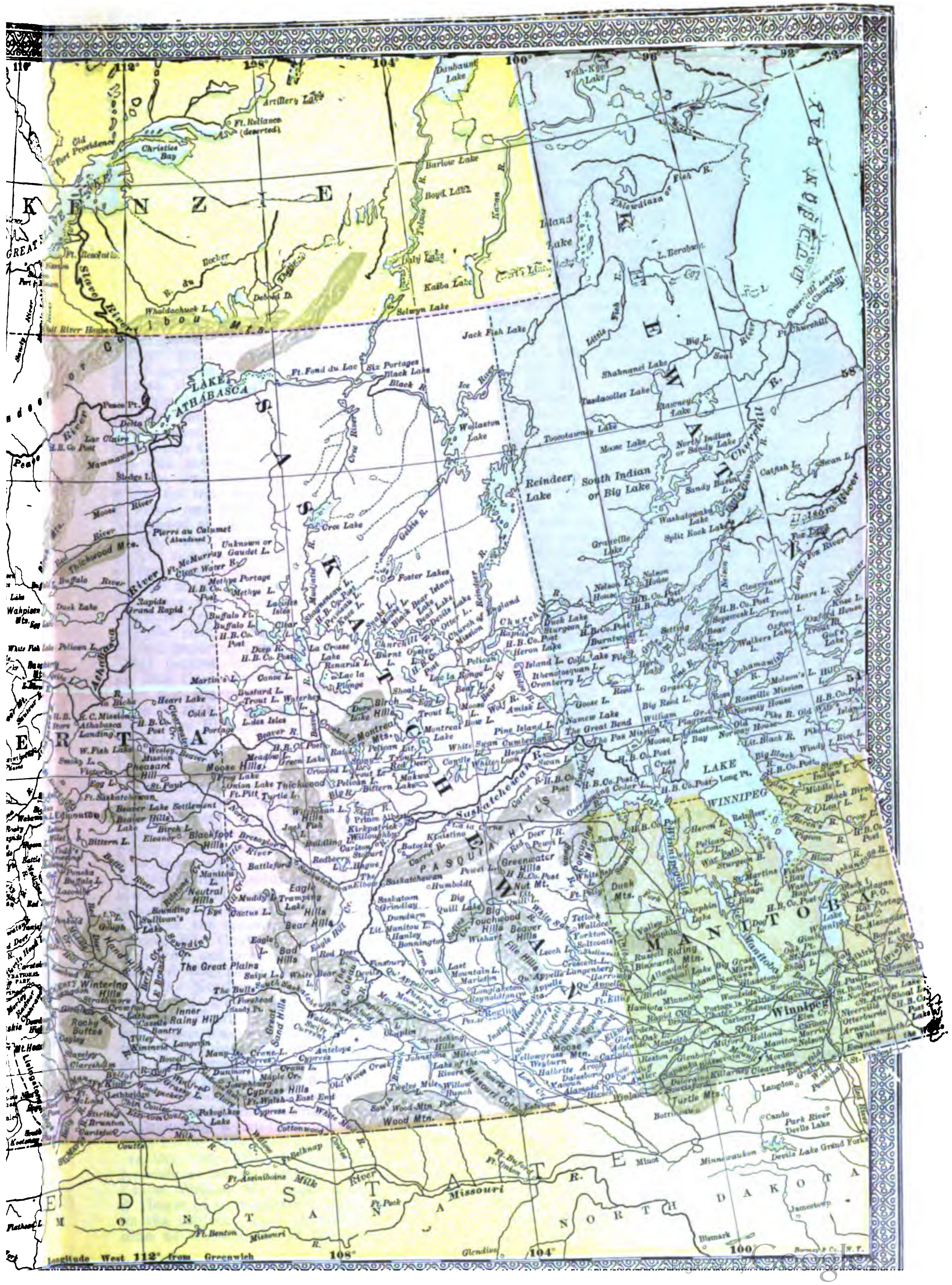
MACKENZIE
KEEWATIN
SASKATCHEWAN
ATHABASCA
ALBERTA
MANITOBA
MONTANA
NORTH DAKOTA
UNITED STATES
HUDSON BAY
GREAT SLAVE LAKE
LAKE ATHABASCA
LAKE WINNIPEG
Lake Manitoba
Reindeer Lake
South Indian or Big Lake
Wollaston Lake
Cree Lake
Dubaunt Lake
Artillery Lake
Christie Bay
Ft. Reliance (deserted)
Old Fort Providence
Ft. Resolution
Slave River
Barlow Lake
Boyd Lake
Daly Lake
Kasba Lake
Selwyn Lake
Island Lake
Ft. Churchill
Churchill R.
Nelson R.
Hayes River
Fox River
Seal River
Ft. Fond du Lac
Black Lake
Peace River
Athabasca River
Ft. McMurray
Clear Water R.
Methye Portage
Lac la Biche
Ft. Saskatchewan
Edmonton
Battleford
Prince Albert
Carlton
Saskatchewan R.
South Saskatchewan R.
Cumberland
The Pas Mission
Norway House
Pasquia Hills
Porcupine Mts.
Duck Mts.
Riding Mtn.
Turtle Mts.
Moose Mtn.
Wood Mtn.
Cypress Hills
Regina
Qu'Appelle
Moose Jaw
Saskatoon
Humboldt
Yorkton
Brandon
Portage la Prairie
Winnipeg
Emerson
Lethbridge
Medicine Hat
Calgary
Ft. Macleod
Milk River
Missouri
Ft. Benton
Ft. Assiniboine
Ft. Belknap
Ft. Peck
Ft. Buford
Minot
Devils Lake
Grand Forks
Jamestown
Bismarck
Glendive
Pembina
58°
54°
116°
112°
108°
104°
100°
96°
92°
Longitude West 112° from Greenwich
Rand McNally & Co. N.Y.

Red and Assiniboine rivers where, near the site of the present city of Winnipeg, the Red River settlement was established. The Nor'-Westers, a rival company to that of Hudson's Bay, claimed this land and every means of annoyance in the power of a strong corporation was freely used, as occasion arose, to injure the settlement. Finally, in 1816, the dispute culminated in a skirmish in which Governor Semple, who was acting for Lord Selkirk, and a number of his colonists, were killed by an armed band of Nor'-Westers.

It was a typical incident, though an unusually violent one, of the conflict which was waged all over the Northwest during the first twenty years of the 19th century between these two great companies. In this case, however, it aroused the lion that was in Lord Selkirk and, though just recovering from illness, he obtained a force of 80 soldiers and a couple of small cannon. With this troop he rushed around the Great Lakes from Montreal, and through the wilderness, captured the chief agent and several partners of the Northwest Company, and sent them to York, in Upper Canada, for trial upon various charges of murder, arson and robbery. They could not well be convicted at such a distance from the scene and under the irregular conditions of their arrest, but the lesson was a good one and for the next few years, until the Hudson's Bay Company absorbed its rival in 1821, there was more peace and quietness in the vast region of their rivalry.

As the years passed the settlement grew in size and importance and Fort Garry, founded in 1835, became the headquarters of the Hudson's Bay Company. The latter, in 1836, purchased for £84,000 the land granted to Lord Selkirk in 1811. Gradually the population was added to by French trappers and hunters and by half-breeds who came from the unions of the French with Indian women and, in time, constituted a population of thousands. Sir George Simpson assumed control of much of the company's affairs after its absorption of the Nor'-Westers and from 1821, for 35 years, he was the leading spirit of the Northwest. He organized the interests of the company, explored and extended its vast territories, reconciled conflicting conditions and established a vigorous personal control. A network of trading posts was constructed across the continent and, when the governor retired in 1856, the Hudson's Bay Company, with 152 regular establishments and over 3,000 permanent servants, dominated the religious, political and social life of the Northwest.

Projected Union with Canada.— Sir Edmund W. Head, lately governor-general of British America, was then governor of the company, and in favor of a complete sale of rights and ownership to the United Provinces of Canada — now the provinces of Ontario and Quebec. Various negotiations followed between the British and Canadian and Company authorities, including a fruitless mission to London in 1865 by the Hon. George Brown, and finally, on 14 Dec. 1867, after the confederation of the old provinces into a dominion had taken place, the Hon. William McDougall introduced in the new House of Commons a series of resolutions upon the subject. They declared that the Dominion of Canada should be extended to the shores of the Pacific; that the colonization of the Northwest, the development of its mineral resources, and the extension of trade within its bounds were alike dependent upon a stable government; and that the welfare of its sparse population would be promoted by the extension of Canadian government and institutions over the entire region. In the following year Mr. McDougall and Sir George Cartier went to England to settle terms of acquisition and, in 1869, the arrangements were finally consummated between the governments concerned.

Canada claimed the whole region as of right; it now accepted the territory upon the condition of paying £300,000 sterling to the company. It granted at the same time to the company a twentieth part of all lands surveyed for settlement in what was called Rupert's Land, and gave certain guarantees against undue taxation. The company, on its side, retained possession of its historic trading-posts and maintained its influence with the natives and its special facilities for the fur-trade.

Provincial Institutions and Government.— The affairs of Manitoba are directed by a lieutenant-governor, appointed for a term of five years by the Canadian governor-general-in-council, with an executive of five ministers of the crown, and a legislative assembly consisting of 40 members, who are chosen every four years by popular vote, unless the house is dissolved before that time elapses under the crown's prerogative as expressed by the lieutenant-governor. The province is represented in the Dominion Parliament by four senators appointed for life by the governor-general-in-council; and by ten members in the House of Commons, elected by popular vote. The judiciary consists of a chief justice, four judges of the court of king's bench and five county judges.

The development of these institutions, however, took time. The first event in the history of Manitoba as a province was the purchase in 1869 by Canada of Rupert's Land from the Hudson's Bay Company for $300,000; the consequent suspicion and easily aroused fears of the ignorant half-breed population; the action of Louis Riel — a clever and unscrupulous half-breed — in playing upon their feelings and gradually stirring them into the rebellion stage; the driving over the frontier of the governor sent from Ottawa; the subsequent period of "provisional" government at Fort Garry under Riel; the murder of young Scott by his orders and the arousing of Ontario; the despatch of an expedition under Colonel Wolseley early in 1870; the entry into Fort Garry and flight of Riel and his associates to the other side of the line. Arrangements were then proceeded with for the reconstruction of affairs and Canada's position clearly placed before the people.

The Canadian government's policy — which might have averted the insurrection had it been properly placed before all the people of the settlement at an earlier period — included the declaration that civil and religious liberties and the privileges of the whole population would be sacredly preserved; that properties, rights and equities, as enjoyed under the company's rule, would be maintained; that a liberal system in the granting of titles to land now occupied by settlers would be pursued; that all classes of the residents would be fully and fairly represented in the government; that municipal self-government would be at once established and the country ruled by a constitution based upon British laws and precedents and practices. On 15 July 1870 the province was duly constituted by royal and parliamentary enactment with Mr. (afterwards Sir) Adams G. Archibald as its first lieutenant-governor. An executive council of not less than five persons was to be appointed, with a legislative council of seven members which was to be increased to 12 after four years and a legislative assembly of 24 members, elected to represent certain electoral districts as constituted by the lieutenant-governor. The duration of the legislature and its functions were to be controlled by the same provisions as applied in the British North America act to the other provinces. Either the French or English language — a privilege afterwards abolished so far as French was concerned — could be used in debates and official records. The legislative council was abolished in 1876 and the number of members in the assembly was afterwards raised to 40. The first organized ministry in the infant province was constituted on 16 Sept. 1870 with the Hon. Alfred Boyd as premier.

Progress and Politics of the People.— The story of Manitoba's early progress is one of steady growth. The slow development of the little town of Winnipeg, which took the place of Fort Garry, was greatly changed by the promised appearance of the Canadian Pacific Railway. It rose rapidly into a city of many thousands, while the steady accretion of farmers in the vast and fertile prairies stretching away toward the distant horizon helped to develop the phenomenal «boom,» typical in its inception and progress of all western periods of expansion, which came to Manitoba in 1879 and 1880, and merged the solid investments of thousands of Ontario business men in fantastic land schemes and non-existent prairie villages of which surveys had not even been made. The inevitable reaction followed, but after that came a slow, but steady and substantial progress which, latterly, is becoming a rapid development.

For many years local politics were of a purely parish nature, and government consisted in legislating for schools, scattered over a large area amongst isolated settlers, providing the beginnings of municipal life, practising the forms of constitutionalism and guarding the interests of the small, though growing population of farmers. Alfred Boyd, 1870; M. A. Girard, 1871; H. J. H. Clarke, 1872; M. A. Girard, 1874; R. A. Davis, 1874; John Norquay, 1878; D. H. Harrison, 1887; Thomas Greenway, 1888; H. J. Macdonald, 1899; and R. P. Roblin, 1900; succeeded each other as prime ministers. With the Canadian Pacific in the early eighties came development and also questions of monopoly, of the right to establish competitive lines, of the necessity of competition and control of rates, of the location of branch lines and all the complications incident to a time of public expansion and the sudden growth of transportation interests. These problems have all been settled, or are now settling themselves, in one form or another. There has, at times, been friction between the provincial government and the Dominion authorities, but never violent trouble; except in the brief and passing matter of the Red River Railway effort to cross the tracks of the Canadian Pacific Railway. The Manitoba school question is dealt with elsewhere. Up to 1911, when the Roblin Government was again returned to power the most important issue was that of the Boundary with a collateral demand from the Dominion for financial allowances similar to those given the new Provinces of Alberta and Saskatchewan or else the handing over of Provincial lands, minerals, and fisheries, to the control of the Provincial Government. With the accession of the Borden Government to power at Ottawa arrangements were duly made and at the 1912 session of the Federal Parliament Manitoba was granted a sum to cover arrears of claims presented totalling $2,178,648; the annual Federal subsidy was increased from 50 to 80 cents per head of the population; the Federal allowance for government, etc., was left at $190,000 per annum but an indemnity in lieu of Public lands totalling $562,500 was granted. With smaller sums and allowances, the annual grant was increased from $838,247 to $1,349,345.

Education.— The school system established by law is undenominational, religious instruction being permitted, should the parent not object. The Dominion government has set apart two sections of land of one square mile each in every surveyed township, for the support of public school education. As fast as settlement progresses, schools are established, and as teachers have to pass a rigid examination before they are appointed, the education of the children is generally of a high class.

At the head of the educational system of the province stands the University of Manitoba (supported by a land grant of 150,000 acres), an examining and degree conferring body, as well as a teaching body in science, affiliated to which are the Episcopal, Presbyterian, Methodist and Roman Catholic colleges; as also the Medical and Pharmacy colleges. Collegiate institutes for higher education are connected with the public school system in Winnipeg, Brandon, and Portage La Prairie. Brandon College is a well-known Baptist institution. There is also a normal school for the training of teachers in Winnipeg. In 1910 the province had 2,227 schools, 2,774 teachers, 76,427 pupils and an average remuneration for teachers of $628,000.

Religion.— The Presbyterian church is the strongest in the province, including in 1901, 65,348 persons. The Methodist church comes next with 49,936. The Church of England has 44,922; the Roman Catholic 35,672; Lutheran, 16,542; Baptist, 9,166, and other denominations aggregate 33,625.

Agriculture and Stockraising.—Wheat, oats, barley, Indian corn, hops and flax grow well. For wheat growing Manitoba presents peculiar advantages, and the principle is here illustrated that the best specimen of a cereal is found along the line of its farthest north development. When compared with the best wheat-growing districts of the United States, the soil of Manitoba is found to produce on an average a greater weight to the bushel. Thirty bushels to the acre is a common crop in Manitoba; while in Southern Minnesota it is 20 bushels, in Pennsylvania and Ohio 15, and in Wisconsin only 14; and while spring wheat (the usual crop) in Manitoba weighs from 63 to 66 pounds to the bushel, that of Minnesota weighs only from 60 to 65 pounds. As to quality also the Manitoba wheat excels; it possesses a large quantity of gluten and sells at ten cents a bushel more than eastern wheat. Potatoes and all other root crops thrive well, while garden vegetables grow with wonderful exuberance. For hay the native prairie grasses in the moist meadows are still largely used, though timothy, which grows freely, is now being considerably cultivated. Cattle.— Shorthorns, Ayrshires, and Galloways — are now largely introduced; stock-raising is an established industry. Cheese and butter-making in scientifically managed creameries and factories is followed throughout the province. In western Manitoba wheat growing is, however, the favorite occupation.

According to various (1911) official figures Manitoba's agricultural interests, investments and products were as follows:

Value of field crops	$73,136,000
Railway mileage of province	3,466
Provincial trade	$37,989,566
Authorized capital of new incorporations	92,491,000
Available agricultural land not granted, acres	36,754,000
Poultry sold, number	941,776
Dairy products	$1,786,073
New farm buildings	3,273,487
Horses, number	251,800
Cattle, number	454,500
Sheep, number	29,600
Swine, number	135,800
Spring wheat, bushels, 60,842,636; value	$40,087,000
Barley, bushels, 23,999,239; value	6,964,000
Oats, bushels, 73,786,683; value,	18,468,000
Flax, value	1,977,000
Potatoes, value	2,151,000
Hay and clover, value	2,264,000
Manufactured output, estimated	40,000,000

Transportation and Financial Conditions.— The chief event of late years has been the coming of the Canadian Northern Railway, its construction from Port Arthur to Winnipeg, its construction through the province and building of various branch lines. The provincial government also obtained control of the Northern Pacific Railway and its branch lines in Manitoba and have pursued a useful policy in both cases of checking and lowering rates from time to time. The Roblin administration in 1906 took action along the lines of provincial acquisition of the telephone service. In 1910 the internal grain elevators of the province were acquired, but the operation was not successful and in 1912 they were transferred to the Grain Growers' Association under special arrangement. The grain crop of the province in 1911, including wheat, oats and barley, was 158,844,608 bushels. The provincial revenue in 1910 was $3,847,321 and expenditure $3,543,044. The provincial liabilities included debentures, etc., of $10,200,000 and Canadian Northern guarantees of $21,000,000.

J. Castell Hopkins,
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Manitoba, Canada, a lake situated in Manitoba province, to which it gives its name, about 59 miles southwest of Lake Winnipeg. It is of irregular shape, 119 miles long, with a maximum breadth of 29 miles, a shore-line of 535 miles, an area of 1,171 square miles, and an average depth of 12 feet. It is 810 feet above sea-level, and 40 feet higher than Lake Winnipeg, into which it drains through the Saskatchewan or Dauphin River.

Manitoba School Question. In 1871, shortly after becoming a Province of the Dominion a law was passed by the Manitoba Legislature which established a system of denominational education in what were then called the common schools. By this Act 12 electoral divisions comprising in the main a Protestant population, were to be considered as constituting 12 Protestant school districts under the management of the Protestant Section of the Board of Education. Similarly 12 districts, made up chiefly of a Roman Catholic population, were constituted an equal number of Catholic school districts, and were placed under the control of the Catholic section of the Provincial Board of Education. Each school division raised the contribution required, in addition to the amount given from the public funds, as might be decided at its annual meeting. And, without the special sanction of its Section of the Board of Education, only one school could be established in each district. Changes suited to the differing proportions of the population were made in 1875; but the general principle was still maintained. The system cannot be said to have worked badly or to have caused any serious trouble between the religious divisions of the Province.

Abolition of the Separate Schools.— In 1890 sectarian feeling was aroused by the eastern agitation over the Jesuits' Estates affair and showed itself in a local movement against Separate Schools. The Premier, Mr. Thomas Greenway, with his lieutenant, Attorney-General Joseph Martin, seized the favorable and popular moment to establish a common school system. By the Act then passed, all school taxes, whether derived from Protestants or Catholics, were appropriated to the support of the new public schools and the old arrangement constituting two Boards of Education was, of course, abolished. Needless to say, the Roman Catholics all over the Dominion were seriously aroused by this action. It seemed to threaten their rights everywhere as well as those they claimed in Manitoba.

Strenuous pressure was brought to bear upon the Dominion Government to disallow the Act as infringing the rights of the minority. A petition dated 6 March 1891, and signed by the Roman Catholic Archbishops and Bishops of the Dominion was presented, stating that both the Schools' Act and the one abolishing the dual language system in Manitoba were «contrary to the dearest interests» of a large portion of the loyal subjects of Her Majesty; contrary to «the assurance given during the negotiations» which determined the entry of the Province into Confederation; contrary to the terms of the British North America Act and of the Manitoba Act; contrary to the principles of public good faith. A little later, on 4 April, the French press of Quebec, published a pastoral letter, issued by Cardinal Taschereau and the hierarchy of the Province, which was read in all the Catholic Churches and claimed that the legislation in question would «despoil the Church of its sacred rights.» It urged once more «the control of the Church over the education of Catholic children in the schools,» and called upon all Catholics «to pray and to work for justice.»

The Question in the Courts.— Following, however, the precedent set in the Jesuits' Estates Case, the Manitoba Schools' Bill was allowed by the Federal Government to go into operation. The Government, however, intimated its willingness to pay the expenses involved in testing the constitutionality of the measure. Meantime, appeal had been entered by Mr. J. K. Barrett of Winnipeg, in the interest of the local Catholic ratepayers and against two city by-laws which imposed a rate of taxation upon Catholics and Protestants, alike, for the support of the public schools. He claimed that the old law was still in force, and based his case upon the 22d section of the Manitoba Act, under which the Province entered the Union, and which stated that «nothing in any such law (Provincial) shall prejudicially affect any right or privilege, with respect to denominational schools, which any class of persons may have by law or practice in the Province at the Union.»

The Manitoba Government maintained, as against this plea that a Separate School system was not really in existence prior to the Province entering the Confederation and that, consequently, the Roman Catholic minority possessed no guarantee whatever. On 2 Feb. 1891 the Court of Queen's Bench in Manitoba sustained the validity of the Act, three Judges being favorable and one opposed. The case was at once appealed to the Supreme Court of Canada. Towards the end of October judgment was unanimously given by the latter body declaring the Act *ultra vires,* allowing the appeals, and quashing the city by-laws. The local Government then announced its intention of appealing the case to the Judicial Committee of the Imperial Privy Council. Late in July, 1892, the decision of the highest British Court of Appeal upheld the Manitoba Courts, declared the legality of the Act of 1890 and reversed the judgment of the Supreme Court of the Dominion.

The Law Affecting Federal Intervention.— The Catholic minority then fell back upon subsection 2 of Section 22 of the Manitoba Act which, it was claimed, provided for an appeal to the Governor-General-in-Council from any act or decision of the Legislature of the Province, or of any Provincial authority, affecting any right or privilege of the Protestant or Roman Catholic minority of the Queen's subjects in relation to education. Their appeal was sent to the Dominion Government by way of petition on 26 Nov. 1892. They admitted that no rights or privileges had been acquired previous to the Union, but pointed out that the second subsection was wider in its terms than the first and provided for an appeal to the Governor-General-in-Council against the legislation affecting rights acquired at any time, including rights or privileges conferred at the Union. They contended that the Act passed by the Manitoba Legislature in 1871, and amending Acts, established a system of Separate Schools and conferred rights and privileges which were taken away by the Act of 1880. They asked for an Order-in-Council restoring Separate School rights.

Before entertaining the appeal asked for by the minority, the Governor-General-in-Council decided to ask the Courts if the appeal was one which could be heard under the terms of subsection 2 of Section 22 of the Manitoba Act. On 20 Feb. 1894, the Supreme Court of Canada held that no appeal lay and that the Governor-General-in-Council had not the power to make the order asked for. On 29 Jan. 1895, the Judicial Committee of the Privy Council reversed the judgment of the Supreme Court. They decided that the Governor-General-in-Council had power to hear the appeal, inasmuch as the Acts of 1890 affected rights or privileges of the Roman Catholic minority in relation to education within the meaning of sub-section 2 of Section 22 of the Manitoba Act. The Court was not asked to determine what particular rights or privileges of the minority had been affected, and purposely refrained from doing so. It was intimated, however, that it was certainly not essential that the statutes repealed by the Act of 1890 should be re-enacted. The «system of education embodied in the Acts of 1890,» the judgment stated, «no doubt commends itself to and adequately supplies the wants of the great majority of the inhabitants of the Province.» If this system were supplemented by suitable provisions for the minority all ground of complaint would be removed.

Issue of the Remedial Order. After the decision of the Judicial Committee was given the Governor-General-in-Council, or in other words the Thompson Government, proceeded to hear the appeal, on 26 February and the early days of March. The result of their deliberations was the passage of the Remedial Order of 19 March 1895. By this Order the Dominion Government required the Province of Manitoba to restore to the minority the following alleged rights: (1) The right to build, maintain, equip, manage, conduct and support Roman Catholic schools in the manner provided by the said statutes which were repealed by the two Acts of 1890 aforesaid. (2) The right to share proportionately in any grant made out of the public funds for the purpose of education. (3) The right of exemption of such Roman Catholics as contribute to Roman Catholic schools from all payment or contribution to the support of any other schools.

Manitoba's answer to this demand was submitted to the Provincial Legislature on 13 June 1895, and adopted on the 19th day of the same month. It was pointed out that the Remedial Order demanded the restoration of the old school laws which had been inefficient; that the policy of 1890 had been adopted after a careful examination of the system previously prevailing; that under the old system, many people had grown up in a state of illiteracy; that apart from the objections to separate schools on principle, the weight of school taxation and the sparseness of settlement in Manitoba made it impossible to carry on a double system of schools. It was urged also that the Ottawa authorities had demanded the restoration of the old system without obtaining full and accurate information as to its working and the Province expressed its willingness to co-operate with the Dominion Government in making a thorough investigation of the whole subject. Legal difficulties were referred to, hasty action was deprecated and a strong appeal was made to the Dominion Government to exercise the greatest care and deliberation in dealing with a question of such vast importance.

Upon receipt of the Manitoba Government's reply the Dominion Government, after a short delay, announced itself as being committed to the policy of remedying the alleged wrongs of the Roman Catholics. The announcement was made in Parliament that the Manitoba Government would again be requested to act and that in the event of a refusal on the part of the Province the Dominion Government would call Parliament in January 1896, and introduce legislation to enforce compliance with the Catholic demands. The controversy was further embittered by those political considerations which occasionally arise when a Liberal Provincial Government is in opposition to the policy of a Conservative Dominion Government or *vice versa.* The complications became still greater in this case when the Protestant sentiment of the Manitoba majority and of the Ontario Orangemen was found in open conflict with an aggressive Roman Catholic sentiment in Quebec which pressed upon the Dominion Government the demands of their co-religionists in Manitoba. The Session of 1896 was duly held, and Sir Charles Tupper introduced his Government's Remedial legislation. But he could not carry it through the diverse sectarian elements of the House and was beaten in the immediately succeeding general elections. The new Liberal Premier,. Sir Wilfred Laurier, had then little apparent difficulty in compromising and settling the issue with the Liberal Premier of Manitoba. The arrangement effected in 1897 may be summarized as follows:

(1) Religious teaching to be permitted in schools if authorized by Resolution of the majority of the Trustees of the district, or if asked for by petition of the parents or guardians of at least 10 children attending a rural school or 25 attending an urban school.

(2) Such religious teaching to take place between the hours of 3:30 and 4 P.M. and to be conducted by any Christian clergyman of the district or person duly authorized by him.

(3) In any rural school where the attendance of Roman Catholic children is 25 or upwards, and in urban schools where it is 40 and upwards, the Trustees may, upon petition, employ at least one duly certified Roman Catholic teacher.

At the 1912 Session of the Manitoba Legislature certain important changes were made in this arrangement — against which for years the Roman Catholics of the Province, headed by Archbishop Langevin, had vigorously protested as compelling them to support, through taxation, both public and separate schools. The vital clauses in the new legislation were as follows:

1. A new definition of the word «school» to mean any schoolroom, whether self-contained, or whether one room in a school building composed of several rooms. In the latter case each room in the building would become a «school» for the purposes of the Act.

2. A provision that in any school where there are 40 children of Roman Catholic parents they shall be separated from the remainder of the children and shall have a teacher of their own faith.

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Manitoba, University of. The Canadian province of Manitoba, which was formed out of Rupert's Land in 1870, was the outgrowth of the Red River Settlement founded by Lord Selkirk and his immigrants under Hudson's Bay Company auspices in 1812–15. The Scottish settlers were joined from time to time by the Metis, the descendants of French-Canadian voyageurs, who married Indian women, and also by the children of company officers and Orkney employees of the Hudson's Bay Company who had taken Indian wives. This mixed community in 1870 numbered 12,000 souls.

To the Metis came from Lower Canada Priest (afterward Bishop) Provencher, who in 1818 established a school, which grew in later times into Saint Boniface Roman Catholic College. The English-speaking half-breeds belonging to the Church of England were educated at Saint John's College, which was reorganized in 1866 by Bishop (afterward Archbishop) Machray. Just as the new province of Manitoba was forming there was established in 1871, by the writer, in Kildonan, near Winnipeg, among the Selkirk Scottish settlers, a Presbyterian college, known since as Manitoba College. This last-named college was in 1874 removed to Winnipeg. These three denominational colleges were all in or near the new city. In 1875 an important meeting was held in the court-house, Winnipeg, by Manitoba College, in which a union of the three colleges under a provincial university was suggested. Governor Morris favored this plan, and in 1877 an act was passed in the legislature of Manitoba establishing the University of Manitoba, to which the three colleges, Saint Boniface, Saint John's, and Manitoba were affiliated. The University was at first to be only an examining body the teaching being done entirely by the colleges.

The new University was unique. It brought together the largest religious bodies of the province, and kept up the standard of education, it being the only source of degrees. Its first examinations took place in May, 1878, when seven candidates presented themselves. In 1878 application was made to the Dominion government for a land grant, and at length, in 1885, under the «Better Terms Settlement» of that year, 150,000 acres of good agricultural wild land was given to the University. This endowment is now valued at $1,250,000. In 1883 a native of Red River Settlement living in England, Mr. A. K. Isbister, who like many others was attracted by the broad and cosmopolitan spirit of the young university, bequeathed $83,000 as a scholarship fund to the University.

In 1882 the Manitoba Medical College was founded and became affiliated to the University. In 1888 a new member of the sisterhood of Arts Colleges — Wesley College of the Methodist Church — was affiliated to the University; a College of Pharmacy was affiliated in 1902. A Baptist college in Brandon, the second city of the Province, though not affiliated, yet sends its students up to the University examinations.

In 1893 the university act was changed to allow teaching to be done by the University in natural science, mathematics, and modern languages, the arts colleges taking up the other departments. In 1898 a site of seven acres in the heart of Winnipeg, valued at $120,000, was given by the Dominion Government to the University, and in 1900 the first building was erected. Teaching in natural science was begun in 1900, and in 1904 six professors in natural science and mathematics were appointed. There is also a large amount of intercollegiate teaching. Degrees are given by the University in arts, law, and medicine, and the several denominational colleges have the power to bestow degrees in theology on students who have passed a certain arts requirement in the University. These degrees on being reported become *ipso facto* degrees of the University.

Thus the two systems of university education — national and denominational — are combined, and the advantages of both obtained. The denominational colleges have their residences and grounds; and exercise discipline and social control over their students, while the provincial university conducts the examinations, confers degrees, and has taken over science teaching, the most expensive department of education. It may take other subjects in the future.

The University is supported by the revenue from the lands, a Provincial Government grant, fees of students and candidates, and by private benefactions — Lord Strathcona giving it for immediate purposes $20,000. In 1904 the University, examined 812 candidates.

The arts curriculum is a blending of a fixed course, with certain options in the first and second years, and then specializing is allowed in the third and fourth years in one of the departments of classics, mathematics, modern languages, philosophy, natural science, or a general course.

The University building accommodates the department of science, which is generally being well equipped for its work. A library has been begun, but is still in its infancy. The several affiliated colleges have large libraries, and the students have access to the Provincial Library and the new Carnegie Library of the city.

As the University of Manitoba is the only university in Canada west of Lake Superior, it cultivates the whole region of Manitoba, new Ontario, the Northwest Territories, and British Columbia. It holds local examinations at several points in Manitoba, as well as Regina, Calgary, and Edmonton in the Territories, and at Vancouver, Kamloops, and Victoria in British Columbia. On account of the vast territory served, and of its having no rival in western Canada, Manitoba University, should no change take place in its prospects, bids fair to be in 25 years the largest university in Canada.

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Manitou, măn'ĭ-too, a name given, among the American Indian tribes, to any spirit, good or evil; also applied to any object of religious awe and reverence. «The Illinois,» wrote the Jesuit Marest, «adore a sort of genius, which they call manitou; to them it is the master of life, the spirit that rules all things. A bird, a buffalo, a bear, a feather, a skin — that is their manitou.» «If the Indian word manitou,» says Palfrey, «appeared to denote something above or beside the common aspects and agencies of nature, it might be natural, but it would be rash and misleading to confound its import with the Christian, Mohammedan, Jewish, Egyptian, or Greek conception of Deity, or with any compound of a selection from some or all of those ideas.» The word was applied to any object used as a fetish or an amulet. It was common among all western and Mississippi tribes.

Manitou, Colo., town, in El Paso County; on the Denver & R. G. and the Colorado M. R.R.'s; about seven miles northwest of Colorado Springs. It is situated in a region renowned for the beauty and grandeur of its scenery, and at an altitude of about 6,330 feet above sea-level. It is in three cañons — William's Cañon, Ute Pass, and Engleman's Cañon. Nearby are Pike's Peak and the Garden of the Gods. The medicinal springs, six in number, are visited annually by a large number of health seekers. The wonderful cave or series of caves, which were discovered by George W. Snider in 1881, have been explored for quite a distance. One of the remarkable features of this remarkable underground natural curiosity is the Guadaloupe Dome and the Pipe Organ. The group of stalactites which have been named the Pipe Organ give forth the complete musical scale, in sweet, clear notes. Numerous waterfalls are in the vicinity of Manitou, also Monument Park, which like the Garden of the Gods, has many peculiar formations of red and white limestone. The Pike's Peak cog railway terminates at Manitou. A large number of tourists visit the town annually, especially in the summer season. The population in July and August is said to be about five or six times greater than in winter. Pop. (1910) 1,357.

Manitoulin, (măn-ĭ-too'lĭn) Islands, Canada, a group of islands in the northeastern part of Lake Huron, which separates the waters of the Lake from Georgian Bay. The name is a corruption of the Indian word Manitowin, which means divinity. Except Drummond Isle, about 25 miles long and 9 miles wide, which belongs to the State of Michigan, the group is a part of the province of Ontario. The largest island of the group is Grand Manitoulin, or Sacred Isle; about 87 miles long and averaging 22 miles wide. Cockburn, or Little Manitoulin, is nearly circular, and about eight miles in diameter. The coast is very irregular, and all are well wooded; Grand Manitoulin and Cockburn have large pine forests. The shore waters abound in fish. Fully half the inhabitants are Indians of the Algonquin race. The cool climate in summer and the striking natural features add to the attractions of the islands and make them a favorite summer resort. Pop. 2,000.

Manitowoc, măn-ĭ-tō-wŏk', Wis., city and county-seat of Manitowoc County; on Lake Michigan, at the mouth of the Manitowoc River, and on the Wisconsin C. and the Chicago & N. W. R. R.'s; about 112 miles northeast of Madison and 77 miles north of Milwaukee. The city, picturesquely surrounded by a semicircle of low hills, was chartered in 1870. It has a good harbor, and regular steamer connection with all of the important lake ports; large grain elevators, ship-building and repair yards, and an extensive export trade in wheat and other grain, lumber, leather, beer, dairy products, etc., and imports of groceries, cloth, and clothing. The manufactures are important, the census of 1909 returning 80 establishments, with $6,764,000 capital stock, employing 1,752 persons at $1,007,000 annual wages, using materials valued at $3,963,000, and with a product valued annually at $5,939,000. There are three large breweries; the other industries were brickyards, hay presses, creameries and cheese-factories, saw- and planing-mills, and manufactories of leather, flour, furniture, foundry products, machinery, agricultural implements, edge tools, cigars, canned goods, and glue. The city has national, savings, and other banks, waterworks, gas and electric light; and daily and weekly newspapers, several of which are published in the German language. Manitowoc is the seat of the county asylum, St. Mary's Hospital, St. Felix Industrial and Reform School, Holy Family Hospital, and the James Library, and has a courthouse, a high school, public and parochial schools, and several handsome churches. Pop. (1890) 7,710; (1900) 11,786; (1910) 13,027.

Manizales, mā-nĕ-sä'lās, Colombia, town, in the southern part of the department of Antioquia; about 95 miles northwest of Bogota. The altitude is about 7,000 feet. It was founded in 1848 and its situation at the junction of the main passes over the mountains, and near valuable gold mines has contributed to its rapid growth. In the valleys, in the vicinity, stock-raising is an important industry. It has fine churches and schools, a good library and a number of comfortable homes. During the civil war of 1877–8 the town was the headquarters of the rebels. The climate is not severe, although in a high altitude, as higher mountains in the vicinity are a protection. Pop. about 20,000.

Mankato, mān-kä'tō, Minn., city, county-seat of Blue Earth County; on the Minnesota River at the mouth of the Blue Earth River, and on the Chicago, M. & St. P., the Chicago G. W., the Chicago & N. W., and the Chicago, St. P., M. &. O. R.R.'s; about 88 miles southwest of Saint Paul. It is situated in an agricultural and timber region, and in the vicinity are valuable stone quarries. Its chief manufactures are knit goods, lime, cement, beer, butter, candy, flour, lumber, foundry and machine-shop products. There are in manufacturing business about 3,000 employees. The principal buildings are State Normal School, a government building, a Carnegie public library, Saint Joseph's and Tourteilotte hospitals. The city has 20 churches, good public and parish schools, a commercial college, and the State school, which has been mentioned. There are four banks with a combined capital of $350,000. The business amounts to about $4,000,000 annually.

The city was first settled in 1852 by eastern people. It was incorporated 15 July 1858, and chartered as a city 6 March 1868. The present government, is by commission, Mankato and Faribault being the only Minnesota cities having this form in August, 1911. Mankato was the scene of several battles during the Sioux Indian War 1862–3. In 1863, 38 Indians were hung for murder. Pop. (1890) 8,838; (1900) 10,599; (1910) 10,365.

Manley, măn'lĭ, **John**, American naval commander: b. 1734; d. Boston 1793. At the outbreak of the Revolutionary War he had command of the armed schooner Lee, with which he cruised along the coast of Massachusetts Bay, making captures of great value to the American army then investing Boston. In July 1778, his ship, the Hancock, was captured by a British frigate and after a rigorous confinement in Halifax, he was exchanged, and in 1782 was put in command of the Hague frigate, which, after lying in a perilous position on a sand bank off Guadeloupe for three days, exposed to the fire of four British ships of the line, contrived to effect her escape. This exploit closed the regular maritime operations of the United States during the Revolutionary War.

Manley, Joseph Homan, American journalist and politician: b. Bangor, Maine, 13 Oct. 1842; d. Augusta, Maine, 7 Feb. 1905. He graduated from the Little Blue Abbott Academy at Farmington, Maine, in 1858 and in 1862, at the age of 21, from the Albany Law School. He was admitted to the bar in 1865, being appointed a commissioner of the United States district court, serving one year. In 1866 he was president of the city council of Augusta and in 1881 was appointed postmaster of Augusta by President Garfield, which office he held for seven years. Acquiring a half interest in the ‹Maine Farmer› he joined hands with James G. Blaine in aggressive local and national politics, dictating the editorial policy of that paper for three years. He was a delegate to the Republican National conventions of 1880 and 1888, was for many years chairman of the Maine Republican State committee and a member of the Republican National committee and was a notable figure in the executive committees of 1896 and 1900, which aided in the election of McKinley.

Manley, Mary de La Rivière, English author: b. in the island of Guernsey about 1672; d. London 11 July 1724. She succeeded Swift as editor of the ‹Examiner› in 1711. She is known for her ‹Secret Memoirs and Manners of Several Persons of Quality of Both Sexes: from the New Atlantis› (1709), a licentious satire that caused the arrest of both the author and the publisher, though they were subsequently discharged. This work was continued in the ‹Memoirs of Europe› (1710). She also published ‹Letters Written by Mrs. Manley› (1696); ‹The Secret History of Queen Zarah and the Zarazians› (1705); ‹The Adventures of Revella› (1714); ‹The Power of Love: in Seven Novels› (1720); and other unimportant books.

Manley, Thomas Henry, American physician and author: b. Tewksbury, Mass., 1 March 1851; d. 1905. He was graduated at the medical department of the University of New York in 1875; and practised in Lawrence, Mass., until 1881, when he removed to New York. He has been a visiting surgeon to many of the hospitals in the latter city; is professor of surgery in the New York School of Clinical Medicine; and has published ‹Operations for Hernia› (1890); and ‹Local Anæsthetics› (1893).

Manlius, măn'lĭ-ŭs, **Marcus**, Roman legendary hero, of the 4th century B.C., called Capitolinus because of his successful defense of the Capitoline Hill. Tradition says he was aroused to action by the cackling of Juno's sacred geese just in time to prevent the surprise of the citadel by the Gauls (390 B.C.). Two years before (392 B.C.), he defeated the Æqui; and in six years after (384 B.C.) was thrown from the Tarpeian rock, having been declared guilty of plotting to become king or dictator. This judgment, almost certainly unjust, was due to the envy of the patricians, who distrusted Manlius' philanthropic endeavors to free plebeians sold for debt.

Manly, Basil, American clergyman and educator: b. Pittsborough, Chatham County,

N. C., 28 Jan. 1798; d. Charleston, S. C., 25 Jan. 1865. He was graduated at South Carolina College in 1821, and, after filling several charges, in 1837 he became president of the University of Alabama, remaining there nearly 20 years.

Manly, John Matthews, American educator: b. Sumter County, Ala., 2 Sep. 1865. He was graduated at Harvard in 1889. Professor of English in Brown University 1891–8; and in the University of Chicago after 1898. He has contributed to several periodicals and has edited ‘Macbeth’ (1896); and ‘Specimens of the Pre-Shakesperean Drama’ (1897).

Mann, Donald D., Canadian contractor and financier: b. Acton, Ont., 1832. In the later 70's he went West, became manager for a firm of contractors who had a sub-contract on the Canadian Pacific line, and thereafter worked continuously as a contractor until the completion of the main railway. Between 1881 and 1883 he completed various contracts for railroads, and in the two following years began railroad-building in the mountains. He also undertook contracts for construction and tunnels in Columbia Cañon and in the Selkirk Range of the Rocky Mountains. Together with Mr. William Mackenzie (q.v.) he constructed the Canadian Northern Railway (q.v.). In 1887 and a part of 1888 they constructed the Canadian Pacific short line through Maine. In December, 1888, Mr. Mann visited Panama, Ecuador, Peru and Chili with a view of building railways for the Chilian government, but was not satisfied with the prospects there and declined the contracts offered. Later he visited China. From August 1889 to November 1892 he was associated with Mr. James Ross in building the Qu'Appelle, Long Lake & Saskatchewan Railway and was one of the original syndicate which built the Winnipeg electric street railway. He is also interested in many other enterprises.

Mann, Henry, American journalist: b. Glasgow, Scotland, 25 March 1848. He was educated in Scotland and England, but at 15 came to the United States where he served in the Federal army in 1864–5 and later in the wars with the Indians in the Northwest. He has been on the editorial staff of the leading New York and Providence newspapers and was special correspondent in the war with Spain. In 1895–6 he was editor of the ‘Home and Country Magazine’ and in 1898–9 assistant editor of ‘Success.’ He has published: ‘Ancient and Mediæval Republics’ (1879); ‘Features of Society in Old and New England’ (1885); ‘Turning Points in History’ (1895); ‘The Land We Live In’ (1896); ‘Adam Clarke’ (1904).

Mann, Horace, American educationist: b. Franklin, Mass., 4 May 1796; d. Yellow Springs, Ohio, 2 Aug. 1859. He was graduated from Brown University in 1819, studied law at the Litchfield (Conn.) law school and in offices at Dedham, Mass., in 1823 was admitted to the bar, and practised at Dedham from 1827 to 1833, when he removed to Boston. In 1827–33 he was a representative in the State legislature, in 1833–7 State senator, and in 1836–7 president of the senate. From the first he identified himself with philanthropic interests. His first speech in the assembly was on religious liberty; and one of his enterprises was the establishment of the State lunatic hospital at Worcester (1833), in connection with which he was chairman of the board of commissioners and later of the board of trustees. In 1837, upon the appointment by the State of a board of education to revise and reorganize the Massachusetts common-school system, Mann became secretary to the board (19 June). He withdrew from politics and from a lucrative practice at the bar, and devoted himself entirely to a work which proved of the greatest significance not for Massachusetts only but for the entire United States. This work he accomplished largely in spite of opposition often pronounced. For the reform of State education he founded and edited the monthly ‘Common-school Journal,’ held teachers' conventions, published 12 most valuable annual reports, and established normal schools. In 1843 at his own expense he visited Europe for the study of Continental methods. He was successful in arousing throughout the country an unprecedented interest in educational affairs. In 1848 he was elected to Congress to succeed John Quincy Adams, deceased; and he served until March 1853. He was strongly opposed to slavery, and fearlessly attacked Webster's course. On 15 Sept. 1852, he declined the nomination for the governorship of Massachusetts, and on the same day accepted the presidency of Antioch College, Yellow Springs, Ohio, in which post he served until his death, greatly influencing the educational development of Ohio. He was a fellow of the American Academy of Arts and Sciences. In addition to his annual reports he published: ‘Reply to 31 Boston Schoolmasters’ (1844); ‘Report of Educational Tour’ (1846); ‘A Few Thoughts for a Young Man’ (1850). ‘Slavery: Letters and Speeches’ (1852); ‘Lectures on Intemperance’ (1852); ‘Powers and Duties of Woman’ (1853); and ‘Sermons’ (1861). Consult the ‘Life’ by Mary P. Mann (1865); and Boone, ‘Education in the United States’ (1890).

Mann, Tom, English socialist: b. Foleshill, Warwickshire, 15 April 1856. His boyhood was spent in farming and mining and from the age of 14 he served an apprenticeship of seven years at engineering in Birmingham; and in 1877 he went to London, where he was prominent in connection with various trade-union affairs, and in 1885 he became a Socialist. Among his works are: ‘A Socialist's View of Religion’ (1896); ‘The Position of the Dockers and Sailors’ (1897); ‘The International Socialistic Movement’; etc.

Manna, a name for several substances, especially a saccharine matter which exudes naturally or from incisions made in the trunk and branches of a species of ash (*Fraxinus ornus*). It first appears as a whitish juice, thickens on being exposed to the air, and when dried forms a whitish or reddish granular substance, which is the manna of commerce. The tree is a native of Italy, and is cultivated extensively in Sicily. June and July are the two months in which the manna is collected. It is detached from the trees with wooden knives and is afterward exposed to the sun for drying. A little rain, or even a thick fog, will often occasion the loss of the collections of a whole day. The taste is sweet, and slightly nauseous. It is a mild purgative, and is principally administered to children. The finest kind of manna is called *flake manna;* it is white or yellowish-white in color, light, porous, and friable. *Sicilian manna* is generally found in small, soft, round fragments; its color is yellowish-brown, and it is generally mixed with more or less impurities. The principal constituent is mannite, chemically separable as a white crystalline substance of a sweetish taste, which also appears as a whitish efflorescence on certain edible seaweeds and fungi. To this, and the saccharine elements, the nutritiousness of manna is due.

Many other sweet tree-juices go by the name of manna, or false manna, since they contain no mannite, but depend for their peculiar qualities upon the possession of melitose or meletzitose. In many cases the exudation of the sap is due to the irritation produced by insects or is the product of the insects themselves. Thus edible exudations are obtained from the oriental tea-tree, sandal-wood and an Australian grass (*Andropogon*); in Europe from the larch and an oak, and in Persia from the camel's-thorn. American manna is derived in California from the sugar pine and from a rush (*Phragmites*); while in India a species of bamboo secretes it so copiously as to form an important food-resource for the people in periods of famine.

The tamarisk manna, derived from the tamarisk trees about the eastern end of the Mediterranean, is not a direct product of the tree, but of a scale-insect, the manna-insect (*Jossyfraria mannifera*), which abounds upon the tamarisk and secretes the substance, which some persons have regarded as the manna of the Bible. In Australia the waxen larval cases of several species of flea-lice (*Psyllidæ*) that feed upon the gum-trees (*Eucalyptus*) are gathered and eaten by the natives under the name of "lerp."

The Scriptural manna (Heb. Man-hu, what is it?) is described in Exodus (xvi. 15) as covering the ground in such quantities as to supply food for the vast multitude of the Israelites. It was small and round like coriander seed, white and tasting like honey and wafer. It cannot be identified with any of the substances known nowadays as manna; but is called in the Bible "bread from heaven," while the Jewish doctors taught that it became to each person who ate it that meat of whatever kind he liked best.

Mannaia. See GUILLOTINE.

Mannheim, män'hīm, Germany, a town of Baden on the Rhine, at the confluence of the Neckar, 66 miles by rail southwest of Frankfort. Dikes protect it from inundation and there are extensive harbors and modern docks. A bridge across the Rhine, here 1,200 feet wide, connects with Ludwigshafen, Bavaria, and there is also a bridge across the Neckar. Mannheim is the first commercial town in the grand-duchy and on the upper Rhine. This it owes to its admirable position on two important navigable rivers, and its railway communications. The principal articles of trade are corn, flour, wood, petroleum, coal, tobacco, cattle, sugar, iron goods, etc. The manufactures consist chiefly of iron-castings, machinery, chemicals, cigars, carpets, woolen goods, celluloid and rubber wares, mirrors, carriages, trinkets, sugar, liqueurs, starch, glue, etc. Mannheim was once strongly fortified and lying not far from the French frontier, and near the centre of military operations, suffered severely during the wars between France and Germany. In a siege by the Austrians in 1795 only 14 houses remained uninjured. Hence, notwithstanding the antiquity of its foundation, it has become an entirely modern town with regular, straight streets, known, as in America, by numbers, and with fine public squares. The principal buildings are the former Palatine palace, with a museum and picture-gallery in one of its wings, a public library, and good gardens behind it; the Jesuits' church, an imposing edifice, with a profusely decorated interior; the former observatory building; the theatre, one of the best in Germany; several gymnasia and schools; conservatory of music; hospitals and orphanage; town-house; railway-station, etc. Pop. (1895) 97,980; in 1899 the suburb of Neckaran was incorporated with it; pop. about 150,000.

Manning, măn'ĭng, **Daniel,** American journalist and financier: b. Albany, N. Y., 16 May 1831; d. there 24 Dec. 1887. At 10 he entered the printing-office of the Albany 'Atlas' which shortly after was merged in the 'Argus' upon which paper he became a reporter and in time an authority in State politics. He was associate editor in 1865 and later was part owner of the paper which in his hands was a strong political power and instrumental in breaking up the Tweed ring. He strongly supported Gov. Tilden's administration and through his membership of the New York State committee he was intimately connected with the leaders of his party. Upon Cleveland's inauguration in 1885 Manning was appointed secretary of the treasury, the affairs of which office he conducted with great ability. He resigned in 1887 as a result of ill health, though he was connected with several commercial and banking enterprises until his death in the same year.

Manning, Henry Edward, cardinal of the Roman Catholic Church and archbishop of Westminster: b. Totteridge, Hertfordshire, 15 July 1807; d. Westminster 14 Jan. 1892. He was educated at Harrow, and Balliol College, Oxford, became a fellow of Merton College in 1832, and in that year he was ordained and appointed curate of Woollavington-cum-Graffham in Sussex. In 1833 he became rector of Woollavington, and was appointed archdeacon of Chichester in 1840. In 1842 he was select preacher to the University of Oxford. He took very little part in the tractarian movement and did not write any of the tracts, but he formed friendships with some of the leaders of the movement. In 1851, after the decision in the "Gorham case," he joined the Roman Catholic Church and was ordained priest. He founded the Congregation of the Oblates of St. Charles at Bayswater, London, in 1857, and upon the death of Cardinal Wiseman was consecrated archbishop of Westminster in 1865. At the Œcumenical Council in 1870 he was an ardent supporter of the infallibility doctrine, and in 1875 was made a cardinal by Pius IX. Manning was a trusted leader of the Ultramontane party in his church, and he commended himself to the world in general by his zeal on behalf of temperance, education, and the betterment of the working-classes. He is the author of four volumes of sermons published before 1850; and among his other writings are: ‘Temporal Power of the Popes’ (1860); ‘The Temporal Mission of the Holy Ghost’ (1865 and 1875); ‘Petri Privilegium’ (1871); ‘The Vatican Decrees’ (1875); ‘The Catholic Church and Modern Society’ (1880); ‘The Eternal Priesthood’ (1883); ‘Characteristics’ (1885); ‘Miscellanies’ (1877–88); ‘Religio Viatoris’ (1889). Consult Lives by Hutton (1894); Purcell (1896); De Pressense (1903); Fitzgerald, ‘Fifty Years of Catholic Life and Progress’ (1901). See His Memorials (1892).

Manning, James, American Baptist clergyman, first president of Brown University: b. Elizabeth, N. J., 22 Oct. 1738; d. Providence, R. I., 29 July 1791. He was graduated at Princeton College in 1762, in 1763 became pastor of a Baptist church at Morristown, N. J., and about a year later pastor of a church in Warren, R. I. There he almost immediately commenced a Latin school, which seems to have been in some sense the germ of Rhode Island College. He had previously proposed to several influential men in his denomination, assembled at Newport, the organization of «a seminary of polite literature, subject to the government of the Baptists,» and had drawn up a plan for such an institution. In 1764 the legislature granted them a charter, and in 1765 he was appointed «president and professor of languages and other branches of learning, with full power to act in these capacities, at Warren or elsewhere.» The college went into operation at Warren in 1766, and the first commencement was held there in 1769, when a class of seven was graduated. In 1770 it was determined to remove the college to Providence, and during the Revolution, when the college edifice was occupied as a military barrack, and afterward as a hospital, he was actively engaged in clerical duties, and also rendered important services to the patriotic cause. In 1783 he resumed his duties at the college, and in 1786 represented Rhode Island in Congress, where he exerted himself to secure the adoption of the national Constitution. From 1770 till the year of his death he was also pastor of the first Baptist Church in Providence. He resigned the presidency of the college in 1790. Consult: Guild, ‘Life and Times of James Manning and the Early History of Brown University’ (1894). See Brown University.

Manning, Thomas Courtland, American jurist: b. Edenton, N. C., 1831; d. New York city 11 Oct. 1887. He was graduated from the University of North Carolina, admitted to the bar and for a time practised law in his native place, but in 1855 he went to Alexandria, La., and there established himself in a large practice. He was a delegate to the Secession Convention and at the outbreak of the war entered the Confederate army as lieutenant. He served as adjutant-general in 1863 and attained the rank of brigadier-general. In 1864 he was associate judge of the supreme court of Louisiana. He was a presidential elector in 1872 and 1876 and in 1877 he was chief justice of the State supreme court. He was denied admission to the Senate upon his appointment to that body in 1880, and in 1882–6 he again filled the office of justice of the supreme court. He was appointed minister to Mexico in 1886 and died in office.

Manning, S. C., town, county-seat of Clarendon County, on the Atlantic Coast Line railroad; about 50 miles southeast of Columbia, and 70 miles north of Charleston. It is situated in an agricultural region, and in the vicinity are large pine forests. Some of the manufactures are flour, lumber, and knit goods. Pop. 1,600.

Man'nite, or **Mannitol,** a singular chemical compound which has the formula $C_6H_8(OH)_6$, and constitutes from 30 to 60 per cent of the weight of the dried juice which exudes from the manna ash (*Fraxinus ornus*), a tree growing in the Mediterranean regions. It occurs also in many other plants, and is formed in the lactic fermentation of sugar, and also in the spontaneous fermentation of the juice of the sugar-cane, in tropical countries. It may be prepared by boiling manna with dilute alcohol, the mannite crystallizing out upon cooling. The crystals are then purified by re-crystallization from water. It is a white compound, crystallizing in needles or four-sided prisms, and is readily soluble in water, insoluble in ether, and but slightly soluble in alcohol. It melts at 329° F., and begins to sublime at about 400° F. Mannite has a pleasant, sweet taste, and in some respects it resembles the sugars. It is not a sugar, however, but a hexatomic alcohol. (See Alcohol.) Chemically, it is derived from the hydrocarbon hexane, C_6H_{14}, by the replacement of six atoms of hydrogen by six molecules of hydroxyl (OH). Sorbite (or sorbitol) and dulcite (or dulcitol) have the same chemical formula as mannite, and resemble it very closely. They are, in fact, isomers of mannite. Sorbite is prepared from mountain ashberries, and dulcite from Madagascar manna. See Manna.

Mannlicher, măn'lĭH-ĕr, **Ferdinand,** Ritter von, Austrian engineer and inventor: b. Mainz 30 Jan. 1848. He was chief engineer of the Northern railroad for many years, and after the success of the needle-gun at Sadowa in 1866 began experiments which ultimately produced a magazine rifle which was adopted by the Austrian army in 1885. He has become famous for his numerous inventions in small arms and was elected to the Upper House of Austria in 1899 in recognition of his distinguished services.

Manobas, mä-nō'bäs, a native tribe of the Philippines, living chiefly in the valley of the Rio Agusan, island of Mindanao, and at some places in the district of Dávao, Mindanao. They are of Malay race, head-hunters, and largely heathen, though the work of the Jesuits among them has resulted in a considerable portion becoming Roman Catholics. The name in earlier times was often applied to other heathen tribes of Mindanao.

Manœuvres, mạ-noo'vėrz. See Army and Navy Maneuvers.

Manom'eter (Greek, «rarefaction measurer»), an instrument for measuring the pressure exerted by a gas or liquid. It may have many forms, of which the mercurial barometer is one. (See Barometer.) One of the commonest designs, for the measurement of pressures not greatly different from that of the atmosphere, consists of a U-tube, one of whose legs is open to the air, while the other is in communication with the gas or liquid whose pressure is to be measured. The lower part of the U is filled with some non-volatile liquid of known density, and the difference between the pressure of the fluid under examination and that of the atmosphere is found by observing the difference between the levels of the manometric fluid in the two branches of the U-tube. If the absolute pressure of the fluid is desired, it is necessary to add the atmospheric pressure to the differential pressure as read from the manometer. In rough work it may be sufficient to assume the atmospheric pressure to be 14.7 pounds per square inch; but in more refined observations the atmospheric pressure must be determined by reading the barometer, simultaneously with the manometer. Mercury is commonly the liquid that is used in the U-tube, but when the differences in pressure that are to be read are very small, some less dense liquid may be used with advantage. Sulphuric acid is often employed in such cases; and where (as in the measurement of chimney draft) a slight amount of evaporation from the manometric fluid is unimportant, water may be employed. When the pressure to be measured materially exceeds one atmosphere, the siphon manometer, as just described, is modified by sealing one of the ends of the U-tube, instead of leaving it open to the air. In this case the pressure is determined by observing the amount of compression that it produces in the air that is confined in the sealed arm of the siphon, by the manometric fluid; for it is known, by Boyle's law, that the volume of the air in this arm is sensibly proportional to the reciprocal of the absolute pressure, so long as the temperature remains constant. (See Gases, General Properties of.) Boyle's law is not rigorously exact, however, and when a high degree of precision is required from the compression manometer, it is necessary to make allowances for its error. Data for this purpose have been given by Amagat, up to 85 atmospheres, when the temperature of the manometer is maintained at 16° C. (60.8° F.) (See Amagat, ‘Comptes Rendus,’ Vol. XCIX., p. 1153; Preston, ‘Theory of Heat,’ p. 403.) In steam engineering the commonest form of manometer is the «Bourdon gauge,» which depends for its action upon the elastic deformation of a flattened metallic tube when exposed to an internal pressure. In practice the flattened tube is bent into a circular form, one end of it being fixed while the other communicates, by means of a multiplying gear, with an index hand which travels over the face of a graduated dial. A tube so constructed straightens out slightly when subjected to an internal pressure, returning again to its original form when the pressure is removed. The deformation is approximately proportional to the magnitude of the pressure (so long as the tube is not strained beyond its elastic limit), and hence the dial may be graduated, without difficulty, so as to indicate true pressures, at least to a degree of precision quite sufficient for the purposes of steam engineering. All such gauges should be carefully compared with a standard mercury column, however, before great reliance is placed upon them; for it is found that they are sometimes seriously in error in some parts of the scale, even when sensibly correct in other parts. In using them in connection with steam boilers, care should also be taken to prevent steam or highly heated water from coming in direct contact with the curved tube, since the elastic properties of the tube are injured by overheating. To ensure the proper protection of the gauge, a siphon, or a complete circular bend, should be placed in the pipe between the gauge and the boiler. The trap so formed will fill with water of condensation the first time the boiler is fired up, and thereafter it will be impossible for steam to enter the gauge directly.

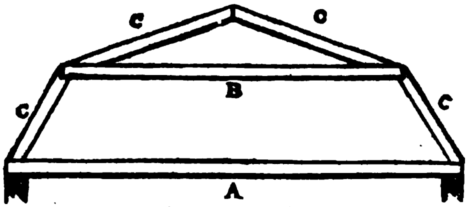
Manon Lescaut, mä-nôṅ lĕs-kō, a romance by the Abbé Prévost, published in Amsterdam in 1733, when its author was in exile. It is appended to ‘Memoirs of a Man of Quality’ as a kind of postscript, and is ranked by critics as the first example in French literature of what may properly be considered a novel.

Man'or (old French *manoir, maneir,* from L. *manere,* to remain, being the residence of the owner) a piece of territory held by a lord or great personage, who occupied a part of it, as much as was necessary for the use of his own household, and granted or leased the remainder to tenants for stipulated rents or services. No manors, with all their incidents and franchises, have been granted in England since the reign of Edward III. One of the most important incidents to these ancient manors was the right to hold a court, called a *court-baron,* which was held within the manor, and had jurisdiction of misdemeanors and nuisances within the manor, and disputes about property between the tenants. The manor system was in vogue in the United States only during the British occupation; but many old manor names like Briarcliffe manor, Pelham manor, etc., are still retained by the present owners of large estates. See also Tenure.

Mans, mäṅ, **Le,** France, the capital of the department of Sarthe, on a height above the Sarthe, here crossed by three bridges, 115 miles southwest of Paris. It consists of a lower and an upper town. The principal edifice is a fine Gothic cathedral of the 10th century. The chief manufactures are metal-works, tobacco, and woolen and linen goods; and the trade in these and other goods is considerable. Le Mans existed in the time of the Romans under the name of Cenomani, a tribe who inhabited the district. Numerous vestiges of Roman structures (subterranean aqueducts, walls, etc.), still remain. It was long in the possession of the English, and Henry II., the first Plantagenet, was born here. During the Franco-German war (1870–1) Gen. Chanzy was defeated here by Prince Frederick Charles and the Grand-duke of Mecklenburg.

Mansard, mäṅ-sär, or **Mansart, François,** fräṅ-swä, French architect: b. Paris 23 Jan. 1598; d. there 23 Sept. 1666. He designed many important buildings in Paris, as well as provincial chateaux and country seats. The chateaux at Bolois are partly his work, and he built the Church of Val de Grâce and the Hotel Carnavalet. The mansard roof is called after him.

Man'sard Roof, in architecture (so called from François Mansard, or Mansart (q.v.), a French architect to whom the invention is attributed), a roof formed of two sets of rafters, of which the upper set are more inclined to the horizon than the lower set, and form an obtuse angle at the ridge. The transverse beams connecting the lower ends of the under set of rafters are called as in ordinary roofs tie-beams; the corresponding beams at the union of the upper and under rafters are called collar-beams.



Mansard Roof.

Mansart, Jules Hardouin, zhül är-doo-ăṅ mäṅ-sär, French architect: b. Paris 16 April 1645; d. Versailles 11 May 1708. He was a nephew of François Mansart, or Mansard (q.v.). He directed all the great building operations of Louis XIV., who heaped favor and wealth upon him. His works include the palace at Versailles; the Maison de Saint-Cyr; the Grand Trianon; the dome of the Invalides; and the Chateau de Clagny, the residence of Madame de Montespan. He also designed the Place Vendôme, and the Place des Victoires.

Manse, in Scotch law, a name given the dwelling house of the minister of the Established Church. In popular use the term is often applied generally to the dwelling house of any minister of a dissenting congregation. In the Established Church every first minister of a rural parish is entitled to a manse, which the heritors or landed proprietors in the parish are bound to build and uphold. When a manse has been built or repaired by the heritors it becomes a free manse, and all ordinary repairs have to be done at the charges of the minister.

Man'sel, Henry Longueville, English logician and theologian: b. Cosgrove, Northamptonshire, 6 Oct. 1820; d. London 30 July 1871. He was educated at St. John's College, Oxford, and took orders in the Anglican Church in 1845. He became Wayneflete professor of philosophy at Oxford in 1859; Regius professor of ecclesiastical history 1867; and Dean of St. Paul's, London, 1868. He was made a canon of Christ Church, Oxford, in 1867. Among his publications are: 'The Philosophy of Kant' (1856); 'The Limits of Religious Thought,' being the Bampton lectures for 1858; 'Metaphysics, or the Philosophy of Consciousness' (1860); 'The Philosophy of the Conditioned' (1866); 'Letters, Lectures, and Reviews' (1873).

Mansfeld, mäns'fĕlt, **Peter Ernst I.,** COUNT, Austrian general and statesman: b. 15 July 1517; d. Luxemburg 22 May 1604. He became governor of the Low Countries after the death of the Duke of Parma.

Mansfeld, Peter Ernst II., COUNT, German Protestant military leader: b. Luxemburg, 1580; d. Racowitza, Bosnia, 29 Nov. 1626. He was a natural son of the preceding, but, disappointed in regard to the inheritance of his father's lands, joined the Protestant princes and became the bitter enemy of Austria. He gained a victory over Tilly at Wiesloch in 1622 but was defeated by Wallenstein at Dessau in 1626, and died soon after.

Mansfield, mănz'fēld, **Edward Deering,** American author: b. New Haven, Conn., 17 Aug. 1801; d. Morrow, Ohio, 27 Oct. 1880. He was graduated at West Point in 1819 and at Princeton in 1822 when he took up the study of law and was admitted to the bar in 1825. He went to Cincinnati and there engaged in practice until 1835 when he accepted the chair of constitutional law and history in Cincinnati College. This post he resigned to enter the field of journalism and was editor of the 'Cincinnati Chronicle,' the 'Atlas,' and the 'Railroad Record.' For many years he was a contributor to the New York newspapers under the title "Veteran Observer." Among his many books are: 'Political Grammar' (1834); 'History of the Mexican War' (1848); 'American Education' (1850); 'Personal Memoirs' (1879); etc.

Mansfield, Joseph King Fenno, American soldier: b. New Haven, Conn., 22 Dec. 1803; d. near Sharpsburg, Md., 18 Sept. 1862. He was graduated from West Point in 1822 and was engaged in engineering service under the government until the opening of the Mexican War when he became chief engineer under Gen. Taylor. He took an active part in the engagements at Fort Brown, Monterey and Buena Vista, receiving promotion to the rank of colonel in recognition of his services. In 1853 he was appointed inspector-general of the United States army and served in that capacity until 1861 when he was made brigadier-general and given command of the Department of Washington which he fortified; he was afterward in command at Hatteras, Camp Hamilton, Newport News, and after capturing Norfolk was placed in command at Suffolk, Va., receiving the rank of major-general. He was in command of a corps of the Army of the Potomac at Antietam and while leading his troops fell fatally wounded.

Mansfield, Richard, American actor: b. Heligoland 1857; d. New London, Conn., 30 Aug. 1907. He first studied art, opening in a studio in Boston for a time, but later returned to England, and entered the theatrical profession. He at first played small parts in comic opera, and first appeared in America as Dromez in 'Les Manteaux Noires' at the Standard Theatre, New York. He afterward was very successful in a wide variety of plays, and became the head of his own company. He created such parts as Beau Brummel, Baron Chevrial, Dr. Jekyll and Mr. Hyde, and Monsieur Beaucaire; among his other most successful roles were: Cyrano de Bergerac, Shylock in 'The Merchant of Venice,' Henry V., Brutus in 'Julius Caesar,' and Prince Karl in 'Old Heidelberg.' His own acting, as well as the work of his company which he carefully oversaw, was of a high artistic standard, carefully worked out in details. Consult: Strang, 'Famous Actors of To-day in America.'

Mansfield, William Murray, EARL OF, British jurist: b. Scone, Scotland, 2 March 1705; d. London 20 March 1793. One of the youngest sons of Viscount Stormont, he was educated at Christ Church, Oxford; studied law; was called to the bar in 1730; won a large Scottish practice and many literary friends, the foremost being Alexander Pope; and in 1742 was made solicitor-general and entered Parliament. Though of Jacobite descent he unfalteringly upheld the Hanoverian interest in 1745, did special service in 1748 by his defense of the Treaty of Aix-la-

Chapelle, and was admitted leader of the House. An attempt to prove him guilty of treason or disloyalty to the Crown was unsuccessful, though often obliquely repeated. He was made attorney-general in 1754, and chief justice and Baron Mansfield in 1756. He was a member of the cabinet, without office, for 15 years, but his part in politics waned after he went on the bench. He was still a typical Tory, however, and in 1770 sided violently with the government in the political libel trials and was sharply attacked by Junius. His unpopularity steadily increased because of his opposition to Wilkes, whose sentence, however, he greatly lightened because of a technical flaw which he discovered himself, and in general because of his contention in various famous cases of libel that the jury could decide only on the facts and not on any question of law. In 1774 in the case, Campbell *v.* Hall, he decided that countries acquired by British conquest were governed by the general principles of the British constitution; but in regard to the American colonies he insisted that their complaints could not be considered until they had submitted themselves to Parliament. He became Earl of Mansfield in 1776; proposed the coalition of 1779; and in 1780 suffered at the hands of the Gordon rioters because of his sympathy with Catholic emancipation. In 1788 he retired from the bench. Though so unpopular, and though constitutionally a believer in royal prerogative, Mansfield was a great judge, whose work was not too conservative, and an able, calm, logical debater. Possibly his greatest labor was his revision of the mercantile law.

Mansfield, England, a town in Nottinghamshire, 14 miles north by west of Nottingham, in a deep valley, surrounded by vestiges of Sherwood Forest. There are cotton-mills, manufactures of silk and cotton hosiery, lace thread-mills, etc.

Mansfield, Ohio, city, county-seat of Richland County; on the Pennsylvania, the Baltimore & O., and the Erie R.R.'s; about 62 miles southwest of Cleveland and the same distance northeast of Columbus. Mansfield was first settled in 1807 by Jacob Newman, and became a borough in 1828 and a city in 1857. It is situated in a fertile agricultural region, and its manufactures and commerce are connected with the farm products of the county. The chief manufactures are boilers, agricultural machinery, pumps, soil pipe, steel harrows, brass goods, electrical supplies, stoves, webbings, suspenders, and wagons. The number of persons employed in the manufactories is about 3,500. The trade is principally in the manufactures of the city, farm and dairy products. The chief buildings are the Ohio State Reformatory, the Public Library, the Children's Home, and the Y. M. C. A. building. The city has 25 church buildings, nine large school buildings and several primary school and kindergarten buildings, one parish school, and two business colleges. Mansfield was the home of John Sherman. There are four banks with a combined capital of $725,000. The government is vested in a mayor, boards of public service and safety and a council of seven members. Four members of the council are elected from the wards and three at large. The city owns and operates the waterworks, also a large sewage and garbage disposal plant. Pop. (1910) 20,768.

E. S. Hiestand,
Editor of Mansfield 'Daily News.'

Mansfield, Pa., borough, in Tioga County; on the Tioga River, and on the Erie railroad; about 108 miles north by west of Harrisburg and 25 miles southwest of Elmira, N. Y. It is in the midst of an agricultural region and near the coal fields and oil region. Its chief manufactures are lumber, glass, sheet-iron, agricultural and mining machinery. It is the seat of a State normal school, and has two libraries, one of about 6,000 volumes belonging to the Normal School, and a city library containing about 2,000 volumes. Pop. (1910) 1,645.

Mansfield College, Oxford, England, a theological institution established in 1889 for the education of men for the Nonconformist ministry. It owes its inception chiefly to Congregational support. Its students must be graduates of some recognized university, or undergraduates of Oxford who have passed Moderations. The staff consists of a principal, a vice-principal, three lecturers, and a bursar. Mansfield House, at Canning Town (West Ham), is a settlement in connection with the college.

Mansfield, Mount, in Vermont, one of the highest elevations of the Green Mountains; in the northwestern part of the State, about 23 miles east of Burlington. The view from its summit includes the Adirondack and White Mountains, Lake Champlain, a large portion of the northern part of Vermont, and some of New Hampshire. See Green Mountains.

Mansilla de García, Eduarda, ā-doo-ār'dā mān-sēl'yā dā gār-sē'ā, Argentine novelist: b. Buenos Ayres 1838. Her maiden name was Mansilla; at 16 she married Manuel R. García, a diplomat; and at 19 published 'El Médico de San Luis,' possibly her best novel. It was followed by 'Lucia Miranda,' a historical novel on the discovery of La Plata, and by 'Pablo, ó la Vida en las Pampas,' which with its fresh description of Argentine life made a great impression in Paris and was praised by Hugo. She was a musician of much talent and wrote, besides novels, several plays.

Mansion House, in London, England, the official residence of the Lord Mayor, built on the site of the Old Stock Market in 1739, at a cost of $213,190. It is an oblong building and contains an Egyptian banquet hall accommodating 400 guests.

Man'slaughter, the 2d degree of felonious homicide. Murder and manslaughter are distinguished from each other by the intent which causes or accompanies the act. If a homicide be not justifiable nor excusable, and yet be not committed with malice aforethought, it is manslaughter. It is quite certain that the intent need not be to kill; for while there must be a criminal intent to make a person amenable to law as a criminal, yet if one crime be intended, and in the act of committing it another of a higher character be also committed without intent, the criminal is responsible for this higher crime. The general principle laid down in respect to manslaughter is, that not only a positive intention to commit some crime, but mere negligence, may make one guilty. If any one take upon himself an office or duty requiring care or skill, he is liable for the want of either; and if death be the consequence of his ignorance or carelessness, he is guilty of manslaughter. So if one driving furiously run over and kill a person whom he did not see, or if one in command of a steamer or sailing-vessel by reason of gross negligence run down a boat and some one in it be drowned, this would be manslaughter. So if any one, whether medical by profession or not, deal with another as a physician, and through gross want of care or skill kill him; or if any one charged with building a house of any kind construct it so badly that it falls and kills persons within or near it; or if in building he drop a stone upon some one passing below, and kill him; in all these cases he would be guilty of manslaughter, provided he were grossly negligent in the act causing the death. This is the essential question.

Blackstone defines manslaughter thus:

> Manslaughter is therefore thus defined, the unlawful killing of another without malice either express or implied; which may be either voluntarily, upon a sudden heat, or involuntarily, but in the commission of some unlawful act.

The judicial treatment of this crime, being regulated by statute, varies in the several States. The element of premeditation is not essential to conviction of this crime. There are cases which the law regards as only manslaughter, without evidence of momentary excitement; partly because the law infers that from such a provocation there must be excitement; and partly, perhaps, because the party killed brought his death upon himself by his outrageous wrong. Thus, if a husband detects his wife in adultery, and instantly and purposely takes either her life or the adulterer's, it is only manslaughter. Not so, however, if he waits for a subsequent opportunity, for then the first reason wholly fails, and the killing becomes murder.

In New York State four degrees of manslaughter are defined. The first degree, briefly stated, consists of killing without the purpose of death, when the deceased was engaged in perpetrating or attempting a crime less than felony, and where such killing would be, at common law, murder. Assisting in self-murder is manslaughter in the first degree, as also wilfully killing an unborn quick child by injury to the mother if it would be murder in case the mother died from the injury. The second degree consists in procuring abortion otherwise; killing in the heat of passion without the intent of death, but in a cruel and unusual manner; or killing unnecessarily one attempting to commit felony. The third degree is killing in heat of passion, without intent of death, but with a dangerous weapon; involuntary killing, by procurement or negligence of another, while the person killed is engaged in committing a trespass on property; suffering an animal known to be mischievous to go abroad without care, or keeping it without care, and thereby causing death; receiving wilfully or negligently so many persons into a boat or vessel as to cause death; racing while in command of a steamboat carrying passengers, bursting the boiler, and so killing; killing by a physician while in a state of intoxication. The fourth degree may be said to include all other modes or forms of manslaughter, known as such at common law, and of a milder kind than the preceding. See HOMICIDE.

Mansurah, män-soo'rä, Egypt, a town on the Damietta branch of the Nile, 34 miles southwest of Damietta. It has railway connection with Zagazig and Cairo, and is the chief depot of the bread-stuffs, cotton, indigo, hemp, and flax which this part of the Delta produces. There are also linen and cotton manufactories, etc. Mansurah was founded in 1221 and here in 1250 during the Crusades, Louis IX. of France was captured and imprisoned.

Manta, män'tä, Ecuador, city, port of entry on the Pacific coast; about 155 miles southwest of Quito. It has an excellent harbor and steamer connection with nearly all the Pacific coast towns of South America. It was founded as early as 1534–5, and for many years its importance has consisted in being the port of Monticristi, which is about 10 miles inland. The chief exports are coffee and rubber. Pop. 4,000.

Mantalini, măn-ta-lē'nē, a low and affected character in Dickens' 'Nicholas Nickleby' who lives on the labors of his wife, a mantua-maker.

Mantaro, män-tä'rō, a river in Peru which has its rise in the mountains in the western part of the province of Junin. Its source is about 13,000 feet above the sea. It flows south and east to Huanta, near which it breaks through the mountains and turns northwest, which course is continued for about 60 miles, when again it changes and flows northeast to Pisquitini, where it joins the Apurimac River and forms the Ené. The Mantaro is nearly 300 miles long and navigable only a short distance above the junction with the Apurimac. It has extensive water-power which is not used except in a few cities.

Mantegazza, Paolo, pä'ō-lō män-tā-gät'sä, Italian author and physiologist: b. Monza, Italy, 1831. He was educated at the universities at Pisa and Milan, spent several years in traveling, visiting almost every portion of the globe, after which he returned to Milan and practised medicine there. He was appointed professor of physiology at Pavia in 1860 and in 1870 became professor of anthropology at Florence, where he founded the Museum of Anthropology, also a society and a review of anthropology. He was a member of the Italian Parliament 1865–76 and then became senator. He is the author of many medical and philosophical books, among them are: 'Elementi d'igiene' (1875); 'Fisiologia del piacere' (1881); 'Le istasi umane' (1887); 'L'anno 3000' (1897); 'L'amore' (1898); etc. He has also written books of travel and has devoted a share of his attention to political affairs.

Mantegna, Andrea, Italian painter: b. Vicenza 1431; d. Mantua 13 Sept. 1506. His master Squarcione was induced by the talents which he displayed to adopt him as a son. The youth employed himself principally in drawing from antiques, and at the age of 16 painted a picture for the grand altar in the church of St. Sophia at Padua. About 1468 Mantegna entered the service of Ludovico Gonzaga, at Mantua, where he opened a school. Here he painted his great picture, the 'Triumph of Julius Cæsar,' for the tapestry of a palace erected in Mantua. It consists of several cartoons, which have since been transferred to Hampton Court. Gonzaga conferred on him the honor of knighthood in reward for his merit. Innocent VIII. invited the artist to Rome to paint in the Belvidere. One of the latest and best of this artist's works is the 'Madonna della Vittoria,' now in the Louvre at Paris, in which Giovanni Francesco Gonzaga is seen returning thanks for the victory gained by him in 1496 over the forces of Charles VIII. The genuineness of this picture is, however, sometimes doubted. There are several others of his works in the Louvre, and an 'Annunciation' in the Dresden Gallery.

Man'tell, Gideon Algernon, English geologist: b. Lewis, Sussex, 1790; d. London 10 Nov. 1852. For many years he practised as a medical man, and employed his leisure time in studying the strata and fossil remains of the weald district, by which he was surrounded. Through his investigations the fossilized skeletons of the Iguanodon and Hylæosaurus were discovered, the fresh-water origin of the wealden beds demonstrated, and many other important facts established in regard to the geology of that district. He published 'The Fossils of the South Downs' (1822); 'Illustrations of the Geology of Sussex' (1822); and the very popular 'Wonders of Geology' (1838); and 'Medals of Creation' (1844). His magnificent collection of fossils was purchased in 1839 for the British Museum.

Mantell, Robert Bruce, American actor: b. Irvine, Scotland, 7 Feb. 1854. He made his début upon the stage at Rochdale, England, in 1876, and in 1878 played in juvenile roles with Modjeska in the United States. He then spent three years in England as leading man, returning to New York to play with Fanny Davenport. He became a star and plays at the head of his own company, presenting the leading classical and romantic roles, including Hamlet, Macbeth, Romeo, Richelieu, etc.

Mantes, mänt, France, a town in the department of Seine-et-Oise, on the left bank of the Seine, opposite Limay, with which it communicates by two handsome bridges connecting the banks with an island in the river, 29 miles west-northwest of Paris. It contains a fine Gothic church, with two lofty towers; a beautiful Gothic tower, the only remains of the church of St. Maclou; and has manufactures of leather and saltpeter, famous breweries, numerous mills, and a trade in leather, corn, and wine. William the Conqueror (q.v.) received his death-wound at Mantes.

Manteuffel, män'toif-fĕl, **Edwin Hans Karl,** Baron von, German field-marshal: b. Dresden 24 Feb. 1809; d. Karlsbad 17 June 1885. He entered the army in 1827 and advanced rapidly, becoming lieutenant-general of cavalry 1861. He took part in the Danish war of 1864, and next year was appointed governor of Schleswig. During the war between Prussia and Austria he commanded the army of the Main, and fought at Hemstadt, Vettingen, Rossbrunn, and Würzburg. He served with distinction in the Franco-German War, especially in several actions around Metz, at Amiens, and from June 1871 to July 1873 he commanded the army of occupation in France, and was made field-marshal. In 1879 he was appointed governor-general of Alsace-Lorraine, and in this capacity showed singular want of skill and tact in ruling a conquered people.

Manti, măn'tĭ, Utah, city, county-seat of Sanpete County; on the Rio Grande, and on the Sanpete V. and the Western R.R.'s; about 125 miles south of Salt Lake City. Manti was settled in 1849 and incorporated in 1851. It is situated in an agricultural region, where sheep raising is one of the principal industries. Large coal mines are in the vicinity. The chief industrial establishments are creameries, flour mills, and machine-shops. The principal buildings are the Mormon temple, which cost $1,500,000, and the public school building. The population in 1910 was 2,423.

Mantinea, măn-tĭ-nē'ạ, Greece, one of the most ancient and important cities of Arcadia, on the frontier of Argolis, on the little river Ophis. The site is now known as Palæopoli, and excavations and explorations by the French school at Athens have disclosed the foundations of the walls and buildings of the ancient city. Mantinea was known for its wealth, and famous for the battles fought near it; in 418 B.C., when the Argives, Athenians, and Mantineans were defeated by the Spartans. In 385 B.C., when the city was taken and destroyed by the Spartans and in 362 B.C., when the Thebans under Epaminondas defeated the Spartans, although the victory of the Thebans was purchased with the life of their commander. Mantinea was, in 226 B.C., surprised by Aratus; and in 222 B.C. taken by Antigonus Doson; on this occasion the town was sacked, and the inhabitants sold as slaves. Another battle was fought near Mantinea 207 B.C., between Machanidas, tyrant of Lacedæmon, and Philopœmen, general of the Achæan League. The latter was victorious, and slew the tyrant with his own hand.

Mantiqueira, män-tē-kä'ē-rä, **Serra Da,** Brazil, a mountain range which is in the southeastern part of the republic. It is about 75 miles from the Atlantic and extends nearly parallel with the coast for about 200 miles. Ranges connected with the Mantiqueira are often included with this range and the name Mitiqueira applied to the whole. Mount Itatiaia, the highest peak, is 9,000 feet above the sea. Several large rivers have their sources in this range.

Man'tis, an orthopterous insect of the family *Mantidæ*. These curious insects, allied to grasshoppers, abound in many parts of the world, and have always excited popular notice, and have been endowed with many supernatural qualities by the ignorant and superstitious of all countries. They are slender, with long, locust-like legs, oval wings, and a long neck-like prothorax, terminating in an angular head with large protruding eyes. The front legs are stout, spiny, fitted for grasping their prey, and are held up in front of them in an attitude that to some suggest prayer. Hence the names praying insect, prophet and the like often given to the more familiar species; to others they suggest other ideas, as of a horse pawing the air, whence our common species of the Southern States (*Stegamomantis carolina*) is known as the «rear-horse,» and in Europe these insects are called «camel-crickets.» Why it should also be called «mule-killer» is harder to explain, probably it is by confusion with a scorpion also so called. These insects in tropical countries have come to assume various forms and hues similar to the flowers near which they lurk to catch the insects visiting the blossoms,— a protective measure which comes under the head of mimicry. A large proportion of the insects upon which they feed are injurious to crops, so that they may be regarded as beneficial to man. Among the Japanese and Chinese they are made to minister to human amusement also, being kept in cages and made to engage in combats upon which the spectators bet money. The eggs of the mantis are laid in an oval mass upon the stem of a plant, and covered with a tough case of hardened mucus, which shows a curiously braided pattern of surface, and is easily recognized.

Mantis Shrimp, a large crustacean (*Squilla empusa*) of the order *Stomapoda,* which dwells in burrows between tide-marks along our eastern coast, and seizes marine worms, and the like, that come within its reach. Its general shape is shrimp-like, but it has strong claws on the second pair of legs, which much resemble the forelegs of a mantis (q.v.), are provided with sharp spines, and are so jointed that they can be folded back upon themselves like the blade of a clasp-knife, and so take a firm grip upon the struggling captives. It is quite blind, although the eyes appear to be well formed. A well-known European species is gathered for food by the coast people.

Mantle, (1) a kind of cloak or loose garment to be worn over other garments. (2) In heraldry the name is given to the cloak or mantle which is often represented behind the escutcheon. (3) The name given an invention used on lamps and in gas lighting. See GAS, ILLUMINATING.

Mantling, in heraldry, an ornament depicted as hanging down from the helmet, and behind the escutcheon. It is considered to represent either the cointise, an ornamental scarf which passed around the body, and over the shoulder; or the military mantle, or robe of estate. When intended for the cointise, it is cut into irregular strips and curls of the most capricious forms, whose contortions are supposed to indicate that it has been torn into that ragged condition in the field of battle. When the mantling is treated as a robe of estate, the bearings of the shield are sometimes embroidered on it. A mantling adjusted so as to form a background for the shield and its accessories, constitutes an «achievement of arms.»

Mantraps, engines for the terrifying of trespassers and poachers (formerly often indicated by the warning notice «man-traps and spring-guns set here»), resembled gigantic rat-traps four feet long. They may be seen in museums; it is, since 1827, illegal to set them save indoors between sunset and sunrise, as a defense against burglars.

Mantua, măn'tū-a̤, Italy, a fortified northern town, capital of the former duchy, and now of the province of Mantua, 80 miles by rail southeast of Milan, on an almost insular site on the Mincio, which here divides into several arms ending in a marshy and insalubrious lake. Communication is maintained between the islands and mainland by several bridges, the chief of which is Ponte di San Giorgio, 800 yards long. Mantua is the see of a bishop, the seat of a civil, criminal, and mercantile court, and the residence both of a military governor and of a provincial delegate. The most remarkable edifices are the cathedral, after an elegant design by Giulio Romano; the church of Sant' Andrea, conspicuous from a distance by its majestic cupola and Gothic tower; the church of Santa Barbara. containing the mausoleum of Carlo Gonzaga; the church of San Sebastiano; the Corte Reale, formerly the ducal palace of the Gonzagas, a huge irregular pile, now partly used as barracks; the Castello di Corte or old castle of the Gonzagas; the Torre della Gabbia, the Torre del Orologio, and the Torre dello Zuccaro; the Beccheria and Peschiera, or shambles and fish market, both built by Giulio Romano; the house of Giulio Romano, the Palazzo Colloredo, with enormous caryatides supporting its façade; the Palazzo del Tè, outside the walls of the town, also built by Giulio Romano, and adorned with some of that master's largest frescoes; the Accademia Virgiliana di Scienze e Belle Arti; the Liceo, the military arsenal, two theatres, one called the Teatro Virgiliano, employed for open-air performances in summer, situated in a fine piazza also named after Virgil, and containing a marble pillar surmounted by a bronze bust of the poet; the library, containing 80,000 volumes and 1,000 interesting MSS.; the civic and two foundling hospitals; the Monte di Pietà, the principal house of correction for the whole of Lombardy. The manufactures are of very limited extent. The trade is chiefly in the hands of the Jews, who live in a separate quarter. The principal article of trade is silk. There is also a considerable trade in timber, which is floated down the Mincio. Mantua was an ancient Etruscan settlement, and in the time of Virgil, a native of the region, was a Roman town. Charlemagne built its first fortifications. Soon after 1115 Mantua succeeded in making itself independent, and continued so till 1276, when it fell under the iron rule of Buonacolsi or Bonacossi. In 1328 it found better masters in the Gonzagas, who, first as captains, then (from 1432) as marquises, and finally (from 1530) as dukes of Mantua, governed it with great ability, and distinguished themselves by the splendor of their court and their patronage of literature and art. The last of the Gonzaga family who reigned in Mantua was Ferdinando Carlo, or Carlo IV., who, having taken part with the French in the War of Succession, was declared to have incurred a forfeiture by withdrawing his allegiance from his liege lord the Emperor of Germany. The Mantuan territory was accordingly annexed to the Austrian possessions in Lombardy, and the remaining part of Montferrat was assigned to Savoy (1708). The fortifications of the town, previously formidable, were completed and put into their present form by the Austrians. In 1796 Napoleon, apparently hopeless of reducing it by any other means, contented himself with keeping it under strict blockade, till famine compelled the garrison to capitulate. After the cession of the western part of Lombardy to Sardinia in 1859, Mantua, with what else of Lombardy remained to Austria, was united to Venetia, and with it was given up to Italy in 1866.

Manu, mä'noo, the reputed author of the most renowned law-book of the ancient Hindus, and likewise of an ancient Kalpa work on Vedic rites. It is matter, however, of considerable doubt whether both works belong to the same individual, and whether the name Manu, especially in the case of the author of the law-book, was intended to designate a historical personage; for, in several passages of the Vedas (q.v.), as well as the Mahâbhârata (q.v.), Manu is mentioned as the progenitor of the human race;

and, in the first chapter of the law-book ascribed to him, he declares himself to have been produced by Virâj, an offspring of the Supreme Being, and to have created all this universe. Hindu mythology knows, moreover, a succession of Manus, each of whom created, in his own period, the world anew after it had perished at the end of a mundane age.

The word Manu — akin to «man» — belongs therefore, properly speaking, to ancient Hindu mythology, and it was connected with the renowned law-book in order to impart to the latter the sanctity on which its authority rests.

This work is not merely a law-book in the European sense of the word, it is likewise a system of cosmogony; it propounds metaphysical doctrines, teaches the art of government, and, among other things, treats of the state of the soul after death.

The chief topics of its 12 books are the following: (1) creation; (2) education and the duties of a pupil, or the first order; (3) marriage and the duties of a householder, or the second order; (4) means of subsistence and private morals; (5) diet, purification, and the duties of women; (6) the duties of an anchorite and an ascetic, or the duties of the third and fourth orders; (7) government and the duties of a king and the military caste; (8) judicature and law, private and criminal; (9) continuation of the former and the duties of the commercial and servile castes; (10) mixed castes and the duties of the castes in time of distress; (11) penance and expiation; (12) transmigration and final beatitude.

Bühler has proved that Max Müller was right in regarding the extant work as a versified recast of an ancient law-book, the manual of a particular Vedic school, the Mânavas; and holds that the work, the date of which used to be given at 1200 B.C., was certainly extant in the 2d century A.D., and seems to have been composed between that date and the 2d century B.C. There are many remarkable correspondences between this work and the Mahâbhârata, suggesting the use in both of common materials.

Manual Acts, in ecclesiastical and church history, acts performed by the hands of the celebrant in the mass, chiefly the fraction of the host, and making the sign of the Cross over it before consecration. Both were objected to at the Reformation.

Manual Alphabet, the deaf and dumb alphabet; the letters made by deaf and dumb persons with their fingers.

Manual Exercises, the exercise or drill by which soldiers are taught to handle their rifles and other arms properly.

Manual Training, a term which, according to the best usage, signifies the systematic study of the theory and use of common tools; the nature of common materials; elementary and typical processes of construction; and the execution and reading of working drawings; and the study of cookery, sewing, printing, etc. The materials referred to are wood, metals, alloys, and plastic minerals; the drawing includes both freehand and instrumental, with pen, pencil, and brush. The systematic study of tools, processes, and materials is the essential feature of manual training; hence the incidental use of tools without system for some ulterior object, is not manual training. There is of course a suggestion of manual training when the teacher shows a child how to handle a pitch-fork; when a woodman teaches a novice how to swing an axe in cutting down a tree; when a foreman shows a green hand how to head a pin. Yet such cases are usually without system and continuity; and accordingly are excluded from the content of manual training. One does not give a boy manual training by turning him loose in a shop, any more than he gives a literary education to a boy who cannot read by locking him in a library. It follows that the manipulations of the kindergarten, the «busy work» in the primary grades on the one hand, and the science laboratory and the commercial workshop on the other, are beyond the pale of manual training.

Manual training proves to be a far better thing than was expected when the name was first used and when the first manual training school was opened, and the present purpose and object of manual training is stated so broadly and philosophically that the statement published for many years in the catalogue of the Saint Louis manual training school seems very modest; to wit: (1) To furnish a broader and more appropriate foundation for higher technical education. (2) To serve as a developing school where pupils could discover their inborn capacities and aptitudes, whether in the direction of literature, science, engineering, or the practical arts. (3) To furnish to those who look forward to industrial life opportunity to become familiar with tools, materials, the methods of construction, and exact drawing, as well as with mathematics, elementary science, and ordinary English branches.

Manual training is essentially a culture study; its function is to develop the child by developing the brain and increasing its control over materials through the hand and eye. In early years the work of a child is qualitative rather than quantitative. Physiologists tell us that the areas of the brain develop gradually and unequally; that a normal child does not recognize accuracy and that he is incapable of precision either in ideas or deeds until he is several grades along in school. Tool work should result in accuracy in thought and in deed, and hence should not be attempted before the sixth or seventh grade. Dr. C. H. Henderson defines Manual Training as «quantitative handicraft.» He adds: «The brain grows by what it feeds upon. Given perfect health and a wealth of sense-impression, especially a wealth of quantitative sense-impression, that is to say, well-trained senses, and we have the physical basis for a full intellectual life. Without this large quantitative knowledge and developed brain, we live in a world of illusion, a guess-world of very imperfect rationality. To cultivate the hand and eye and ear, even the nose and the tongue, is to enlarge the material of thought and the tool of thought.» In 1882, before the National Educational Association at Saratoga, the writer of this article defined Manual Training as «a new art of expression,» in the concrete, as contrasted with verbal description, and graphical representations. This view of manual training has been much elaborated of late, with the result that «expression» is by many persons regarded as the very essence of manual training. This result is unfortunate, since it confuses «expression» with the «art of expression.» The former is a product of manual training; the logical study of the «art» constitutes the sum and substance of the educational feature known as manual training.

All arithmetical operations depend upon the «fundamental rules»; the scientific study of a language begins with declensions and conjugations. So tool-work, drawing, needlework, cooking, etc., begin with fundamental processes with typical appliances upon typical materials. The articles constructed, the figures drawn, the garment sewed, or the dishes cooked, are incidental like blackboard work in long division, and like them they are valuable because they involve effort and result in mastery and power. The real end and aim of all education, whether «manual» or «spiritual,» is the developed, strengthened, disciplined, executive person, regardless of the fate of the exercises or products which were the means of his development.

Originally, when manual training first took definite form in school education, it was generally assumed that it was intended to supersede the old form of trade apprenticeship, and not a few people defended and supported it on this ground. Because a boy learned how to use tools, how to keep them in order, and how to treat the common materials of construction, it was claimed that he was learning a trade, or several trades, and so the manual training school was regarded as a trade school. In spite of the fact that this assumption and this claim were both wrong, the practical value of the boy's knowledge of tools and skill in their use was for some years regarded as the chief evidence of the value of manual training.

In all ages men have recognized the value of skill in the use of tools and the processes of construction. The mythical Vulcan, the Jewish Tubal Cain, the Greek Dædalus, Archimedes of Syracuse, the Miltonian Memnon, are familiar examples. The greatest invention of the ages has been the generation, transmission, and utilization of mechanical power, and along with it has come the invention and use of tools. Rousseau advocated systematic instruction and practice in the details of a trade or occupation; and Carlyle in words now familiar to us all declared that man was a tool-using animal; that without tools he was nothing; with tools, he was all. In every land men advocated the learning of a trade for a livelihood, or for culture; witness, Peter the Great of Russia; the King of Prussia; and the New England seer, Emerson — but in all cases it was taken for granted that the only avenue to mechanical skill and culture lay through an apprenticeship to a builder or manufacturer. Schools were for the study and mastery of books. The arts of the schoolroom were for masters and freemen, hence they were noble, and were called the liberal arts. The arts of the mechanic were for serving men, and were acquired only by intimate association with mechanics; so the practical arts were held to be degrading, because requiring a base companionship.

Later the invention of machinery and the use of costly machine tools so far modified and limited apprenticeship as almost to ruin it. Trade schools sprang up all over Europe, and native American skilled mechanics ceased to exist. Numerous «manual-labor» or «half-time» schools came into being in America, but they involved no forward step, for the manual elements were unsystematic and unprogressive, since the purpose of the labor was to earn a living while gaining literary culture. Engineering schools in Germany, England and America introduced some features of «shop-work» with skilled mechanics engaged upon commercial work as foremen. Next arose a wide-spread demand for an opportunity for American boys to acquire the arts of the mechanic and at the same time avoid the narrowing unscholarly atmosphere of the trade school. It was then that it was first proposed «to put the whole boy to school,» a maxim first used in Boston in 1885. The phrase meant to combine manual with mental training; to put the liberal arts and the mechanic arts into the same curriculum; to deal simultaneously with material forces and appliances and with spiritual forces and appliances.

This consummation was helped in a signal manner by an exhibit at the Centennial Exhibition at Philadelphia in 1876. In the educational exhibit from the Imperial School of Moscow there was a full presentation of the method of tool instruction devised by Victor Della-Vos, who gave three years to tool instruction and then three more to actual construction, with engineering students. His systematic analysis of tools and processes offered a practicable basis for such work in the programme of secondary schools. Professor John D. Runkle of the Massachusetts Institute of Technology performed a great service to education by publishing a report upon the Russian Exhibit, by emphasizing the difference between «instruction» and «construction,» and by insisting upon the former as the special province of the school. Instruction shops for students of college grade were opened in Boston and in Saint Louis in 1877. The Saint Louis Manual Training School was established 6 June 1879, and opened in September 1880, as a school of secondary grade. This was the first of its kind and soon attracted wide attention from educators both at home and abroad. The Baltimore Manual Training School opened in 1883; the Jamestown, N. Y., School and the Chicago Manual Training School in 1884; the Toledo School the same year; the Central Manual Training School of Philadelphia in 1885; and then the movement became general. All these schools were of high school grade, and there was a close resemblance in curricula, equipments, and methods of instruction.

This progress was made not without strong opposition. It was asserted that tools and shops would lower the educational tone, degrade the high purpose of the school, and introduce confusion into the orderly conduct of the secondary school. It was claimed by eminent educators that the time spent in manual training would be an intellectual loss; that the graduates would become «a degraded mass of operatives» that the school was undertaking work which did not belong to it, etc. There is now abundant evidence that all these fears were groundless and that all the evil predictions were false. Better still, systematic and thorough manual training was found to have intellectual and moral value far exceeding all expectations.

Great as is the economic and industrial value, the effect upon the mind and the heart is of far greater value. A recent writer, looking at the reflex action of manual training upon the pupil, maintains that when «rightly conceived and carried on, it promotes co-ordination, it develops creativeness, it broadens culture, it strengthens character.» Nevertheless objections occasionally appear, some of which are extremely amusing. One opponent says: «I am opposed to teaching boys how to be sticks in all cases of emergency. You put a lad into a palatial shop and teach him how to be helpless all the rest of his life because he hasn't the tools handy.»

In Germany where educational manual training was first introduced in 1886, there was violent opposition, partly because it was thought to be purely industrial, and partly on the general ground that manual training had not a single valid claim to entrance into the school programme. For arguments pro and con the reader is referred to the Reports of the United States Commissioner of Education and those of the National Educational Association for the years 1883–1894 inclusive. Active opposition practically ceased in 1890.

In 1904 there was in nearly every large city at least one manual training high school, and there were hundreds of secondary schools in which more or less manual training is available as an optional study. The European plan of making it a pure «extra» to be taken after hours is in little favor in the United States. No sooner was manual training shown to be a valuable educational feature in secondary schools than numerous efforts were made to introduce it into grammar schools in an elementary form. Hundreds of experiments have been tried with carefully selected lessons in wood, with hand tools only. In this study of tools and methods the Swedish Sloyd (so called) has served a very useful purpose in the way of suggestions. It is true the wooden spoons and ladles of Sweden have disappeared, and careful drawing as a preliminary to tool work has come into being, but the value of presenting a «motive» to a young child quickly became evident. An older pupil appreciates the theory of a tool and is at once interested in its peculiar construction, its range of service, and the correct ways of using it, just as an older boy is interested in the study of a rifle and in shooting at a mark, knowing that men use rifles for shooting at game, burglars, and public enemies. Children of from 10 to 14 years of age are always anxious «to make something,» though generally quite unable to do so in a fruitful manner. They are incapable of good workmanship and impatient under criticism of matters to which they have given little or no thought. They are interested in finished objects, not in the sequence of steps, not in accurate measurements, close fits, and the use of the right tools in the right ways. Hence the greatest care is necessary in elementary grades that the exercises are simple, involving few elements, and that they are capable of analysis into steps which the child can fairly appreciate. Above all he must learn when and how to use each particular tool.

In England manual training is more often called technical education, and it is more often than not associated with trades, and even this in a majority of cases is given in evening schools. There is as yet in Great Britain no general conviction that manual training is essential to intellectual development and that its moral influence is wholesome and strong. Accordingly it is planned for working people chiefly. Undoubtedly the educational value of tool work of the most elementary character as developed by Dr. Solomon of Sweden has had great influence in England, but manual training of a severer and more intellectual sort owes its establishment largely to Sir Philip Magnus of London, Sir William Mather of Manchester, and Prof. Ripper of Sheffield. Sir William has not only encouraged its introduction into Manchester schools, but has built and equipped a «Department of Manual Training and Technical Instruction» in Gordon College, Khartum, in Sudan, for the benefit of Sudanese boys. There is an abundance of elementary manual training in France, particularly in Paris, but no sooner is the boy old enough and strong enough to learn a trade than he is put at trade work. The French are convinced, as indeed are all nations, that the principles and details of a trade like the fundamental principles of a profession may be most successfully taught in a special school connected with a commercial or manufacturing establishment. Hence all the fine specimens of metal work exhibited by French educational institutions are the work of special or trade schools. Educational tool work is found in Australia, Japan, China, India, and in South America.

The Methods of Tool Instruction.— Methods vary greatly, not only with pupils of different grades where variation is necessary, but with different teachers in the same grades. While children of 12 years can be taught to care for and properly use some edge-tools, instruction in regard to the theory of machine tools, the laws of heat and friction, the theories of strength and stiffness are beyond them. In the hands of an expert every good hand tool has abundant theory and elegant uses. These should be carefully taught and illustrated. A manual training school is a place where the care and use of tools, details of processes, natures of materials, and the essential forms of construction are systematically explained and taught. No school omitting such systematic work is worthy of the name. Manual training, like instrumental music, is something to be taught, something to be studied and learned. The notion is too prevalent that the pupil must be left to find out how tools are to be used, and how the parts of a construction are to be joined — by himself without the aid of the teacher. One writer says «the pupil makes what he wants to make, and what he does not want to make is left unmade. He usually decides without help from the teacher. He is at liberty to go ahead and work out his own ideas rather than those imposed by the teacher.» The trouble is that the novice, whether pupil or teacher, has no mechanical ideas worthy of serious consideration. The mechanic arts like other arts which have been slowly developed by study and research, should first be taught in all their fulness by one who has analyzed them into fundamental principles and processes, and who is an expert in teaching them. Both research and manufacture may properly supplement the course in a mechanical laboratory. Moreover, for the sake of clearness and fulness, the class method of instruction should be used. Assuming a well graded class (and the assumption is as reasonable in manual training as in any other study), the exposition and demonstration is far more logical and thorough when given to the class, as a whole, than when given in fragments and gestures to individuals. The place for individual instruction is in supplementing class instruction for the benefit of special pupils. The class method means progress as a class, as is generally the case in academic branches.

Long experience justifies the class method. Let the pupils be comfortably seated about the teacher, who should be equipped with a standard set of appliances. Every pupil should be able to see, hear, and to make notes or sketches. The statement of principles and theories and practical demonstration should rarely occupy one fourth of the laboratory period. The style and workmanship of the teacher should be as nearly perfect as possible. His handwork should always be accessible for inspection and model; he should never begin work for his pupils to finish, or finish work they have begun. Be it ever remembered that not the finished exercise, but the *doing of it,* is the main thing. The course of study in a particular laboratory should always be logical, never difficult, and more or less original every year. Like a flight of steps on a steep incline, the lessons should be suited to the pupils, without useless repetitions and without needless complications. The meaning and purpose of every lesson should be clear, and at its end the sense of mastery should reward every pupil. Synthetic exercises should follow the elements at intervals, more frequently with young pupils than with older. Such combinations stimulate zeal and show the logic of the course. A finer construction may end the course in each laboratory, but its educational value must not be over-estimated.

The Programme.— Seventh and eighth grade pupils may have one lesson a week in elementary work, not exceeding 2 hours in length. The ninth, tenth and eleventh grades may have 2 lessons per week in tool-work, and 2 in the rudiments of drawing and lettering, each lesson covering two school periods. The twelfth grade may extend the length of a lesson over three periods in the machine-tool laboratory, but have fewer lessons per week. The length of the lesson should depend upon the capacity of the pupils to give close attention to the work in hand. When attention fails, education stops. With the younger classes the full length of the lesson should not be given to one kind of occupation. For instance, let the plan be: A few minutes to general criticism of last exercise; a few to exposition and demonstration; a few to making or reading the working drawing; the remainder to steady work on the «regular» or an «extra» exercise. The element of comparison and criticism, by both pupil and teacher, should never be neglected. The standard should ever be reasonable perfection.

Size and Equipment of Laboratories.— Every laboratory should have from 40 to 60 square feet of floor space per pupil; the floor should be dry and warm; the room should be well lighted and ventilated; all moving machinery should be driven by an electric motor under the immediate control of the teacher in charge; and immediately adjoining should be a store-room and a suitable lavatory. The mechanic arts equipment of a secondary school with 300 boys should contain a series of at least five working laboratories, namely: (1) For bench work in joinery and carving, and inlaying wood. (2) For wood-turning and pattern work. (3) For modeling, molding and casting. (4) For forging, brazing and soldering. (5) For metal work with bench and machine tools.

The second and third laboratories named above should be grouped as one suite, with one lavatory and store-room. This combination is for the 10th grade, or second-year pupils in a high school. Among engineering students (who are three or four years older) one finds heavy wood-working machines, foundry cupolas, steam hammers, gear cutters and 18-inch lathes and other machinery.

It may be well to point out the difference between a mechanic arts laboratory and the ordinary commercial shop. They differ in equipment, in the character and functions of the skilled men in charge, in the method of management, and in the character of the product. (1) In the commercial shop there is a great variety of tools and machines. In the laboratory there is a large degree of uniformity. (2) In the commercial shop the men in charge are skilled workmen, but not teachers. They are there to fill orders and to execute work as mechanics. In the mechanic arts laboratory the sole function of the skilled people in charge is to teach. (3) In a commercial shop every man is kept at work at what he can do best, and everything contributes to the production of articles for the market. In a mechanic arts laboratory when a boy or a class has learned a process or mastered a material, work ceases in that direction and something else is learned. The only product of a school laboratory of any great importance is the boy himself, and everything which does not contribute to his training and culture is excluded.

From the above it is clearly evident that the more a Manual Training School is made into a factory, the less it is a school. It goes without saying that manual training is but one feature of a secondary school. It occupies but two of the six periods on the school programme, and does not require home study. When such study is counted and added to the time given to mathematics, science, language and literature, it is evident that manual training occupies, in a well organized school, not more than one fourth of the time and intellectual energy of the faithful pupil.

Drawing.— The rudiments of freehand and mechanical drawing should go hand in hand through the course, covering lettering, orthographic, cabinet, isometric, and perspective projections; intersections, developments, tinting, line and brush shading; shadows; the details of machine and building construction; ornament, ancient and modern; tracing, blue-printing, pen-sketching, with some use of water colors — such are the elements to be combined in proper proportion. Domestic science and art for the girls is the counterpart of manual training. It may properly include some light wood work, and nearly all the drawing already laid down; and in addition, art study and practice, house decoration, needle and sewing-machine work, garment cutting and fitting, cooking and household economics. See Trade Schools.

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Manucodia, măn-ū-cō'dĭ-ạ, in ornithology, a group of birds either belonging or closely allied to the *Paradiscidæ*, and peculiar to the Papuan sub-region. The plumage is glossy steel-blue; the outer and middle toes are united for some distance, and there is an extraordinary convolution of the trachea in the males, to which the loud and clear voice of the birds is owing. Mr. Sharpe divides the Manucodia into two genera: Phonygama (q.v.) and Manucodia proper, of which four species are admitted. *Manucodia chalybeata* (*chalybea*), from the northwest, and *M. comriei*, from the southwest of New Guinea; *M. atra*, widely distributed over the Papuan sub-region, and *M. jobiensis*, peculiar to the island whence it derives its specific name.

Manuel I., Comnenus, man'ū-ĕl kŏm-nē'nŭs, a Byzantine emperor: b. about 1120; succeeded his father, Joannes II., in 1143, died in 1180. The valor which he had displayed against the Turks induced his father to bequeath the crown to him rather than to his elder brother Isaac, who was immediately imprisoned by Axuch, the minister of the deceased emperor. Returning from his campaign in Cilicia, Manuel was received with enthusiasm at Constantinople, but was at once involved in wars both in the East and the West, which lasted with brief intermissions through his reign. In 1144 he subjected Raymond, the rebellious Latin prince of Antioch. In 1145 he defeated the sultan of Iconium in successive pitched battles. In 1147 he promised his aid to the new crusade headed by Louis VII. of France and Conrad III. of Germany, and though he allowed them a passage through his dominions he gave secret information to the Turks.

In 1148 he began the most important war of his reign with Roger, the Norman king of Sicily, who had taken Corfu and prepared to invade Greece. He formed an alliance with the Venetians, who within a year joined him before the fortress of Corfu, which was surrendered after an obstinate siege. He was prevented from invading Sicily by hostilities of the Servians and Hungarians, instigated by Roger, the former of whom were vanquished in two campaigns, but the latter protracted the war till 1152. In that year he suffered a reverse from the Turks in Cilicia, but his general, John Ducas, gained so great successes in southern Italy that Manuel conceived the project of reuniting the eastern and western empires.

The defeat of Alexis, the successor of John Ducas, by William, the successor of Roger, soon followed; the Sicilian admiral Maius routed the Greek fleet off Negropont, and advanced toward Constantinople; and Manuel therefore accepted an honorable peace in 1155. Those Greek prisoners who were silk-weavers were retained in Italy, and gave origin to the flourishing Italian silk manufactures. In the following years he waged successful wars with Raymond, prince of Antioch, and Az-ed-din, the Turkish sultan. A new war soon broke out with Gejza, king of Hungary, which was terminated by a disastrous defeat of the Hungarians near the present Semlin. In 1176 he experienced a terrible defeat from Az-ed-din in the mountains of Pisidia, and was obliged to sign a disadvantageous peace. By breaking the treaty and renewing the war he obtained honorable terms. Depressed by this disastrous expedition, he never recovered his former military enterprise and ambition. The heavy war taxes levied from his subjects during his reign were often employed in pensioning ministers and men of influence at foreign courts, while his troops went unpaid.

Manuel II., Palæologus, pā-lē-ŏl'ō-gŭs, a Byzantine emperor, born in 1348, succeeded his father Joannes V. in 1391, died in 1425. At the death of his father he fled from the court of the sultan Bajazet, with whom he had been left as a hostage. The consequence was a war with Bajazet, in which Manuel was supported by an army of Hungarians, Germans, and French. The allies, under the command of Sigismund, king of Hungary and afterward emperor of Germany, were defeated at Nicopolis in 1396, with the loss of 10,000 men. Constantinople was besieged, and its fall seemed impending, when the conquests of Tamerlane diverted the arms of the sultan. Manuel visited Italy, France, and Germany, vainly seeking assistance from the western princes. In the conflict between the Tartars and the Turks, he acted with diplomatic skill, and secured peace to his empire. He sent ambassadors to the council of Constance with instructions to urge a union of the Latin and Greek Churches; but his real object was only to obtain aid from the kingdoms of the West, and to alarm the Turks by the negotiations with those kingdoms.

Manuel, Don John, Spanish prince and author: b. Escalona, Spain, 5 May 1282: d. 1349. He was a nephew of Alfonso X., and cousin of Sancho IV. His public life was a restless and turbulent one, but his chief claim to remembrance comes from the fact that he was one of the first and one of the best of Spanish prose writers. He wrote in a style of singular simplicity and charm, and few Spanish authors have succeeded so well in giving to their words the calmness, the weight, the richness which come only from long experience and reflection. His principal work that remains is 'Libro de Patronio,' more commonly known as 'El Conde Lucanor,' which has been translated into the French and German languages.

Manufacturers, National Association of, an American association organized in Cincinnati in 1895. It had three primary objects, increasing the export trade; influencing State and National legislation; and arbitrating labor disputes. The association maintains a general office in New York city and issues numerous confidential reports and bulletins for the exclusive use of its members. The association is opposed to trade-unionism. In 1903 it had nearly 2,000 members. It publishes 'American Industries' (semi-monthly), and 'The American Trade Index' (monthly).

Manufactures, American. See American Manufactures.

Manumis'sion, in Roman law, the solemn ceremony by which a slave was emancipated. Constantine the Great allowed the Christian masters to emancipate their slaves before the altar on festival days, and especially at Easter, by placing the deed of emancipation on the head of the freedman in the presence of the congregation. See EMANCIPATION: EMANCIPATION IN LATIN AMERICA; EMANCIPATION PROCLAMATION.

Manures and Manuring. See FERTILIZERS.

Man'uscripts (Latin, *manuscriptus*, written by the hand), are literally writings of any kind, whether on paper or any other material, in contradistinction to printed matter. Previous to the introduction of printing all literature was contained in manuscripts. All the existing ancient manuscripts are written on parchment or on paper. The paper is sometimes Egyptian (prepared from the real papyrus shrub), sometimes cotton or silk paper (*charta bombycina*), which was invented in the East about the year 706 A.D., and used till the introduction of linen paper, and in common with this till the middle of the 14th century; sometimes linen paper, the date of the invention of which, though ascribed to the first half of the 13th century, on the authority of a document of the year 1243, written on such paper, is nevertheless exceedingly doubtful. The earliest mention of quill pens is in the seventh century. The most common ink is the black, which is very old. The oldest, however, was not mixed with vitriol, like ours, but generally consisted of soot, lamp-black, burned ivory, pulverized charcoal, etc. Red ink of a dazzling beauty is also found in ancient times in manuscripts. With it were written the initial letters, the first lines, and the titles, which were thence called *rubrics*, and the writer *rubricator*. More rarely, but still quite frequently, blue ink is found in ancient manuscripts; yet more rarely green and yellow. Gold and silver were also used for writing either whole manuscripts (which, from their costliness, are great rarities), or for adorning the initial letters of books. With respect to external form, manuscripts are divided into rolls (*volumina*, the most ancient way, in which the troubadours in France wrote their poems at a much later period) and into stitched books or volumes (properly *codices*). Among the ancients the writers of manuscripts were mainly freedmen or slaves (*scribæ librarii*). Some of the professional copyists in Rome were women. When Origen undertook the revision of the Old Testament (231 A.D.) St. Ambrose sent to his assistance a number of deacons and virgins skilful in caligraphy. Subsequently the monks, among them the Benedictines in particular, were bound to this employment by the rules of their Order. In all the principal monasteries was a *scriptorium*, in which the *scriptor* or scribe could pursue his work in quiet, generally assisted by a *dictator*, who read aloud the text to be copied; the manuscript was then revised by a *corrector*, and afterward handed to the *miniator*, who added the ornamental capitals and artistic designs.

It is more difficult to form a correct judgment respecting the age of Greek manuscripts from the character of the writing than it is respecting that of Latin manuscripts. In general it is to be remarked that in a Greek manuscript the strokes are lighter, easier, and more flowing the older it is, and that they become stiffer in the progress of time. The absence or presence of the Greek accents is in no respect decisive. Some Greek papyri are earlier than the Christion era, but most are not earlier than about the 6th century. The characters in Latin manuscripts have been classified partly according to their size (*majuscula, minuscula*), partly according to the various shapes and characters which they assumed among different nations or in various periods (*scriptura Romana antiqua, Merovingica, Longobardica, Carolingica*, etc., to which has been added since the 12th century the *Gothic*, so called, which is an artificially pointed and angular character); and for all of those species of writing particular rules have been established, affording the means of estimating the age of a manuscript. Before the 8th century punctuation marks rarely occur: even after the introduction of punctuation, manuscripts may be met with destitute of points, but with the words separate. Manuscripts which have no capital or other divisions are always old. The *catch-word*, as it is termed, or the repetition of the first word of the following page at the end of the preceding, belongs to the 12th or subsequent centuries. The fewer and easier the abbreviations of a manuscript are the older it is. Finally, in the oldest manuscripts the words commonly join each other without break or separation. The division of words first became general in the 9th century. The form of the Arabic ciphers, which are seldom found in manuscripts earlier than the first half of the 13th century, also assists in deciding the age of a manuscript. Some manuscripts have at the end a statement when, and commonly also by whom, they were written (*dated codices*). But this signature often denotes merely the time when the book was composed, or refers merely to a part of the manscript, or is entirely spurious. The most ancient manuscripts still preserved are those written on papyrus which have been found in Egyptian tombs. Next to them in point of age are the Latin manuscripts found at Herculaneum, of which there is a rich collection in the Naples Museum. Then there are the manuscripts of the imperial era, among which are the Vatican Terence and Septuagint and the Alexandrine Codex of the British Museum. Since the middle of the 19th century many MSS. of Greek writings have been found in Egypt, among the chief being that containing the orations of Hyperides, several containing parts of the works of Homer, Plato, Demosthenes, etc., that in which occurs a portion of the Antiope of Euripides, and the almost complete text of Aristotle's work on the constitution of Athens. It was the custom in the Middle Ages to obliterate and erase writings on parchment for the purpose of writing on the materials anew. This custom ceased in the 14th century, probably because paper came then more into use.

Manuscripts, Illumination of. The art of illuminating manuscripts dates from the remotest antiquity. The Egyptian papyri were ornamented with vignettes or miniatures attached to the chapters, either designed in black outlines or painted in primary colors in distemper. The Greek and Roman manuscripts of the 1st century with which we are acquainted were not illuminated. The oldest ornamented manuscripts that have survived are the Dioscorides of Vienna and the Virgil of the Vatican, both of the 4th century, and having vignettes or pictures in a Byzantine style of art. The use of ornamental initial letters was introduced at an early period, and must be distinguished from the painted pages of the Byzantine manuscripts. At first the initial letters were of the same size and color as the text, but the Syriac manuscripts of the 7th century have them with a pattern or border. They soon increased to a great size, being in some cases 24 inches in length. They were most used in the 8th and 9th centuries. They at last degenerated to the last decadence of art, the grotesque. From the 8th to the 11th century the initials in use were composed of figures of men, quadrupeds, fishes, birds, etc. The initials of the 12th century are made up of masses of conventional foliage interspersed with the animal figures of the preceding centuries. Continuous borders, with vignettes, tail-pieces, etc., were also prevalent in later times, and some manuscripts are ornamented with very artistic designs. The English and French manuscripts may be recognized by their delicate light-blue and green colors; those of Flanders by the heaviness of their drawing and the dark hues of the coloring. In Italy and Spain the tortuous patterns of animals and flowers were painted in bright colors and gold. In the early Irish manuscripts the figures are rudely drawn; the writing is large and bold, and the capitals profuse. The peculiarity of this style is the use of dots, generally in red, following the outline of the initials; delicate spiral lines, interlaced ribbons, and tesselated patterns. The most interesting specimens of this style are the Book of Kells at Dublin, and the Durham Book in the British Museum. In the 16th century the art became extinct. Some attempts have been made to revive it by adorning paper, parchment, and vellum with designs in color or metals.

Manutius, mạ-nū'shĭ-ŭs, **Aldus** (Ital. Manuzio, Manuzzi and Manucci), Italian printer: b. Sermonetta, near Belletri, in the neighborhood of Rome (and, hence commonly known as Romanus) 1450; d. 6 Feb. 1515. He began his studies at Ferrara, and continued them at Rome where he was tutor to princely families. He learned Greek in Ferrara under Guarini and at the suggestion of the Prince di Carpi established a printing-press at Venice 1489. He gained the reputation of being learned in Greek, Hebrew and Latin and entertained in his house many scholars of the day, forming his «Neacademia» or New Academy, which later was styled «Academia della Fama.» He was the author of ‘Dictionarium Græcum’ (1497); ‘Institutiones Græco-Latinæ’ (1501–8); ‘Grammaticæ Institutiones Graecæ’ (1514); ‘De Metris Horatianis’ (1509). His son PAULUS (b. 12 June 1512; d. 6 April 1574) continued (1533) to manage the printing-press at Venice, and subsequently (1561) presided over the papal press, Typographia Vaticana, at Rome. He wrote a commentary to Cicero's Letters, and ‘Epistolæ Selectæ.’ ALDUS, the younger, son of Paulus (b. 13 Feb. 1547; d. Rome 28 Oct. 1597), was a scholar and author from his earliest youth. He continued his father's work at Venice and Rome. Consult: Renouard, ‘Annales de l'Imprimerie des Aldes’ (1834); Didot, ‘Alde Manuce et l'Hellénisme à Venise’ (1873); Goldschmid, ‘A Biographical Sketch of the Aldine Press at Venice’ (1887); Omont, ‘Catalogues des Livres Grecs et Latins, imprimés par Alde Manuce à Venise’ (1892). See ALDINE EDITIONS.

Manx Cat, a breed of house-cats, originating in the Isle of Man, which are characterized by very high hindquarters, and, as a rule, by a very short tail. See CAT.

Manzanillo, män-thä-nēl'yō, Cuba, city, port of entry, in the western part of the province of Santiago de Cuba, on the Gulf of Guacanabo. It has a large harbor which is protected by a number of small islands. The city is the port for Bayamo, an inland city about 40 miles east by north from Manzanillo. The low land and the mangrove swamps around the place make it very unhealthy. It is well built and has a number of fine churches, hospitals and schools,— among the schools four are high schools. Pop. 15,115.

Manzanillo, Mexico, seaport, in the state of Colima; on the Pacific at the entrance to the Bay of Cuyuttan; about 40 miles west of Colima, the capital of the state. A railroad connects Manzanillo and the capital, and the city has steamer connections with the principal ports on the Pacific coast.

Manzani'ta, a popular name for various species of *Arctostaphylos* of the order *Ericaceæ*, especially *A. fungens* and *A. manzanita*, which are considered identical by some authors. They are shrubs or small trees which sometimes exceed 20 feet in height, and often form impenetrable thickets in the Rocky Mountain region from Oregon southward. They have alternate, evergreen entire leaves, usually white or pinkish flowers in long-panicled racemes and generally smooth berry-like drupes. Another well-known species often called by this name is the bearberry (q.v.), a trailing evergreen shrub which extends from the Arctic region to the mountains of Mexico, whose red berries form one of the principal foods of ptarmigan and other related birds. The great-berried manzanita (*A. glauca*), a California species, bears fruit more than half an inch in diameter. Of the 30 species of the genus, probably a dozen are used for ornamental purposes; some Central American ones in greenhouses where the climate prevents outdoor use; the shrubby western kinds in mild climates; and only the trailing kinds in cold localities. The gnarled roots are an important resource for fuel in the untimbered parts of California.

Manzano, Juan Francisco, hoo-än' frän-thēs'kō män thä'nō, Cuban poet: b. Havana, August 1797; d. there 1854. A negro slave he wrote and published several volumes of verse before he was manumitted (1837), gaining especial fame by ‘Mis treinta Años’ (1836), translated into French, German and English, and by ‘Apuntes Autobiográficos,’ which was never printed in Spanish, but was published in English by Richard Robert Madden in 1840 under the title ‘Poems by a Slave in the Island of Cuba recently Liberated.’ Manzano's other works include ‘Cantos à Lesbia’ (1821), several excellent lyrics reprinted in Calcagno's ‘Poetas de Color’ (1868), and a drama ‘Zafira’ (1842).

Manzanos, män-zä'nōs, a natural park, in Lincoln, Bernalillo, and Santa Fe Counties in New Mexico, southeast of Albuquerque. The Manzano Range, the highest peak of this section, numerous table-lands, and valleys, with many springs and small streams, are the chief features of this park. The Rio Grande is on the west side; the base of the mountains is about 1.000 feet above the river, and about 11,000 feet above the level of the sea. The almost perpendicular, stupendous red cliffs which rise above the plain and form the western face of the mountains, are almost unscalable. South of the red-cliff region is the cañon of Las Moyas; and south of this cañon Bosky Peak, the highest point of the range. Near the summit of the peak is a spring which gushes up in a lake about 50 feet wide.

The view from the summit of the range at some points includes the green valley of the Rio Grande, mountains west of Albuquerque, and north to the walls of Santa Fe, and intervening valleys and mountains. On the west of the park, or the western border, are the white Manzano salt lands, on the southeast the gypsum desert. On the level mountain tops are stretches of clearing where the grass grows luxuriantly. Between Hell Cañon and Chilili is a region of immense pine and piñon forest. Some of the animals found here are deer, bear, and wild turkey. Grains, vegetables, alfalfa, fruit and other farm products are raised. Sheep, horses, and cattle are raised extensively.

Manzoni, mān-zō'nē, **Alessandro,** Italian poet and novelist: b. Milan 7 March 1785; d. there 22 May 1873. He studied at Milan and Pavia, and published in 1806 his poem on the death of his friend Imbonati, which was followed in 1815 by his 'Sacred Hymns' ('Inni Sacri'). In 1819 appeared his first tragedy, 'Il Conte di Carmagnola,' the first drama in which an Italian defied the unities. This play was reviewed and praised by Goethe, who took a warm interest in every subsequent production of Manzoni. The death of Napoleon inspired one of the finest odes of the century, 'Il Cinque Maggio' ('The Fifth of May'). In 1823 his second tragedy, 'Adelchi,' appeared. This, as well as its predecessor, finds more favor in the closet than on the stage. After this Manzoni divided his time between country pursuits at his residence in the neighborhood of Milan, and the composition of his romance 'I Promessi Sposi' ('The Betrothed'), a Milanese story of the 17th century, published in 1827, and which has been translated into most of the European languages (Eng. in Bohn's library 1883). He strove earnestly to make Tuscan the universal language in Italy. As a poet he outrivaled all his Italian contemporaries. Verdi's 'Manzoni Requiem' is a magnificent musical tribute to his memory. Consult: Sauer, 'Alessandro Manzoni' (1872); Stoppani, 'I primi anni di A. Manzoni' (1874); Bersezio, 'A. Manzoni, studio biografico e critico' (1873); Cambu, 'A. Manzoni, reminiscenze' (1885); Waille, 'Le romantisme de Manzoni' (1890).

Maoris, mā'ō-rĭz or mow'rĭz, native inhabitants of New Zealand, a people of Polynesian race, as is attested not only by ethnological considerations but by their own legend that they came from Hawaiki (Hawaii or Samoa). Their carefully kept genealogies go back less than a score of generations, so that it seems probable that their coming to New Zealand was four or five centuries ago. Remains of a previous population with Papuan characteristics have been found. The Maoris are well built, with longer bodies and shorter legs than the European type; they have black hair, little whisker on the face, and smooth bodies, wide open, straight black eyes, heads slightly macrocephalic, the index being 77, nose straight, and color slightly brown. Their costume, no doubt adopted only upon their coming to a colder country than their early home, was a loose garment, woven from the fibre of *Formium tenax*. Tattooing they brought with them to New Zealand and perfected it. They tatooed the face, decorating in this way the young warrior after his first successful fight, and adding fresh designs for each new exploit. They also knew how to make carvings of great delicacy, and armed themselves with stone weapons. Their religious beliefs were crude, but tinged with animism; they recognized the soul as distinct from the body and surviving it; but connected an enemy's cunning and bravery so closely with his dead body that they ate it, thus to win his warlike virtues, locating intelligence in the brain and courage in the heart. Their worship combined ancestral cult with deification of natural forces and some fetishism. They were divided into tribes, six of these representing the divisions among the original settlers. A warlike people, their chief had absolute power and could pronounce «tapu» or taboo (q.v.) at will. Before the coming of the English they were mostly vegetarian, caught some fish, lived in bark or bough huts, and made canoes. Polygamy was practised, and the *arikis* or priest-chieftains acted as physicians, having some knowledge of herbs. Both their numbers and physique have suffered sadly since the introduction of civilization. For the history of the Maoris since British occupation, see NEW ZEALAND, *History*.

Map, or **Mapes,** māps, **Walter,** English scholar and poet of the 12th century. He was probably a native of Herefordshire. He studied at the University of Paris, and became a favorite at the court of Henry II. He attended the Lateran Council of 1179, and was appointed archdeacon of Oxford in 1197 Map is now generally believed to have been probably author, or in large part, author of 'Lancelot' in the Arthurian cycle. It is extremely probable, at any rate, that Map did contribute to the bringing of the cycle into its present state; but it is uncertain to what extent his work has survived. He is undoubtedly the author of a curious book 'De Nugis Curialium,' a note-book of the events of the day and of court gossip. It was edited for the Camden Society in 1850 by Thomas Wright. To Map is attributed the famous drinking-song beginning:

Meum est propositum in taberna mori.

Map. The term map is derived from the Latin word «mappa,» meaning a napkin. During the Middle Ages the name «mappa mundi,» signifying world napkin, was applied to geographical representations of the world on account of the fact that the maps made during that period, at least, were painted on cloth.

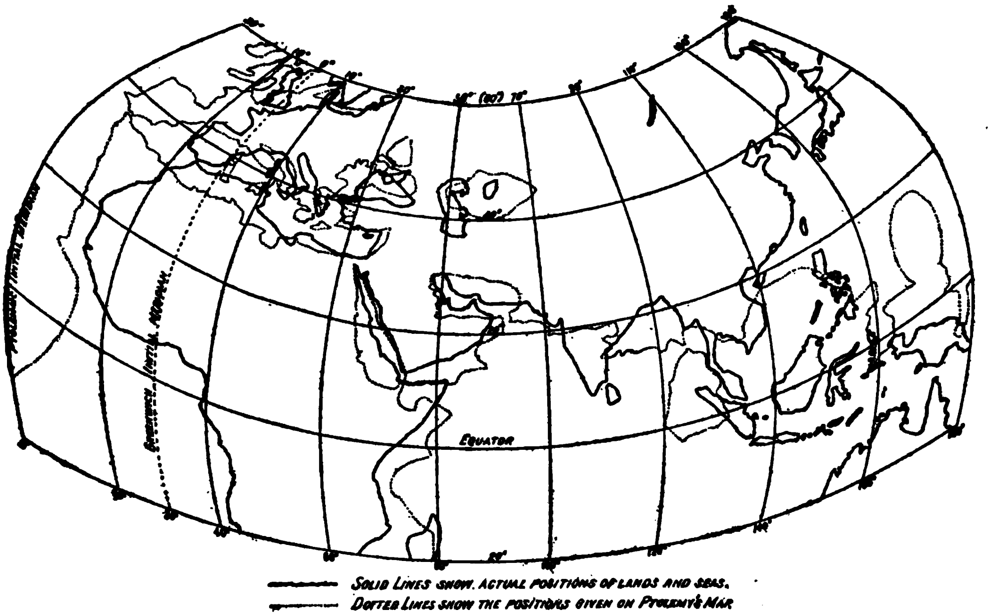
The object of maps and charts is to accurately exhibit to the eye by suitable methods of representation, on a reduced scale, and on a plane surface, the relative positions of points, lines, and other objects situated on the spherical surface of the earth. As commonly used the term chart is synonymous with map, but the former is usually applied to delineating the positions of the stars in the celestial vault, and to the mapping of hydrographic data, while the term map is almost exclusively applied to representations of the surface of the earth. For example, there are the «star charts» compiled and published by the various observatories, the «maps» of the

United States Geological Survey, which represent the land areas, and the "charts" of the United States Coast and Geodetic Survey, which show the depths of the waters along the coast line of the United States.

History.—The earliest maps consisted of simple drawings which merely represented the relative positions of a few known points on the earth's surface, and defined in a general way the partly known and partly conjectured limits of the land and water areas. Map making undoubtedly originated among the wandering tribes of mankind and not among those who inhabited permanent locations such as towns and villages, and were used by those tribes to perpetuate for the benefit of posterity landmarks identifying the regions travelled over by them during their wide excursions to unsettled parts of the world. This is evidenced by the well-known fact that the American Indians and the Eskimo, and many of the Polynesian tribes, customary wanderers, are very acute in apprehending the meaning of maps, while the majority of the settled Negro tribes are absolutely lacking in this respect. It is stated that a map drawn by an Eskimo woman enabled Sir Edward Parry to discover Fury and Hecla Strait, while the experience of many pioneer surveyors and topographers, derived from their work through the extensive wildernesses of the American continent, will attest to the general accuracy of elementary Indian charts, and of the capacity of those Indians to understand the maps made by others.

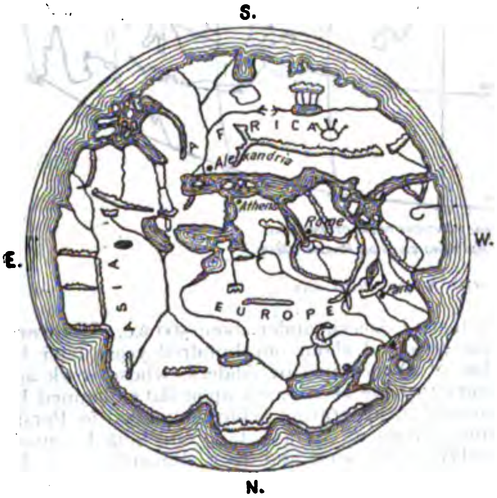
Among civilized peoples, the earliest examples of maps recorded are those of the Egyptians. According to Apollonius of Rhodes (230 B.C.), the Egyptians of Colchis, a colony which dated from the time of Rameses II. (1340 B.C.), possessed maps engraved on wooden tablets which had been handed down to them from a preceding period. These maps accurately defined the limits of land and water areas, and the positions of roads and towns. Other ancient Egyptian maps are the route maps which were prepared under the direction of King Sesostris, probably during the Twelfth Dynasty; certain old maps in the Alexandrian library referred to by Strabo. and probably collected by Eratosthenes; and the map on papyrus in the museum at Turin, which represents the topographical features of a gold mining district in Nubia. Maps of equal if not greater antiquity are recorded among the ancient Babylonians, who originated the idea of dividing the ecliptic into the twelve signs of the zodiac and also the sexagesimal system of numeration which led to the custom of dividing the circle into 360 degrees of 60 minutes each, with each minute subdivided into 60 seconds, and also to the corresponding divisions of the hour.

Among the Greeks, the first map appears to be that of Anaximander about 560 B.C. His work was followed about one hundred years later by that of Democritus of Abdera, whose work appears to have been based upon data obtained by himself in his travels, which extended to Persia and perhaps as far as India, and added considerably to the east and west dimensions of the known world areas. These circumstances probably led to the depiction of the world disk in the form of an oval, a distinct departure from the circular form employed by Anaximander and others. About 150 B.C., Hipparchus introduced among the Greeks the Babylonian system of numeration, and discarding the unreliable geographical data of Erastosthenes and others which were mainly obtained from travellers, suggested the use of only actual astronomical determinations of the latitudes and longitudes of the various points as the true basis for checking distances and directions. His suggestions were practically carried out by Marinus of Tyre, whose work was subsequently corrected by Ptolemy


Ptolemy's Initial Meridian
Greenwich Initial Meridian
Equator
Solid Lines show. Actual positions of lands and seas.
Dotted Lines show the positions given on Ptolemy's Map

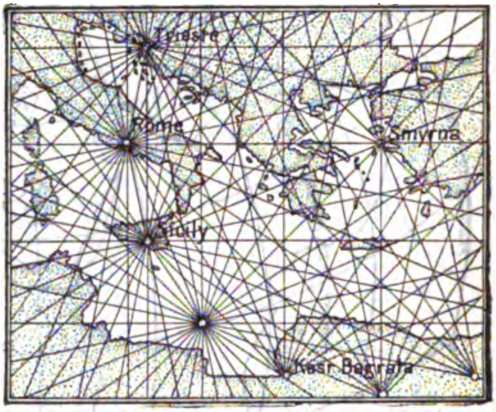
Ptolemy's Map Compared with Actual Positions about the second century A.D., into a map which is generally considered to be the most complete summary of geographical information prior to the sixteenth century. In this connection it is well to understand that from the time of Aristotle (384 B.C.), the mathematicians, astronomers, and geographers were well aware of the fact that the earth was a sphere and not the flat disk of the Ionic Greeks in the days of Anaximander, the ancient Egyptians, and the Babylonians. Therefore, the map making problem solved by Hipparchus, and the successful solution of which formed the foundation for Ptolemy's work, involved the devising of a projection by means of which the spherical surface of the earth could be represented on a plane surface. Although Ptolemy is credited with being the father of rational cartography, it does not appear that any maps were actually drawn by him. The oldest editions of the Ptolemaic maps on record appear to be the work of Agathodæmon, a mathematician who lived in the 5th century A.D., and constructed maps accurately based upon Ptolemy's data.

Among the Romans the art of map making was confined to various kinds of sketch maps valuable for military and political purposes. They did not apply the scientific methods of the Greeks, and although both Cicero and Seneca mention general and topographical maps, and it is a fact that a survey of the whole Roman Empire was made during the reign of Augustus, the grave errors of Ptolemy's maps in all of the Mediterranean countries awaited rectification until the later Middle Ages.



Outline Sketch of Borgia Map (15th Century)

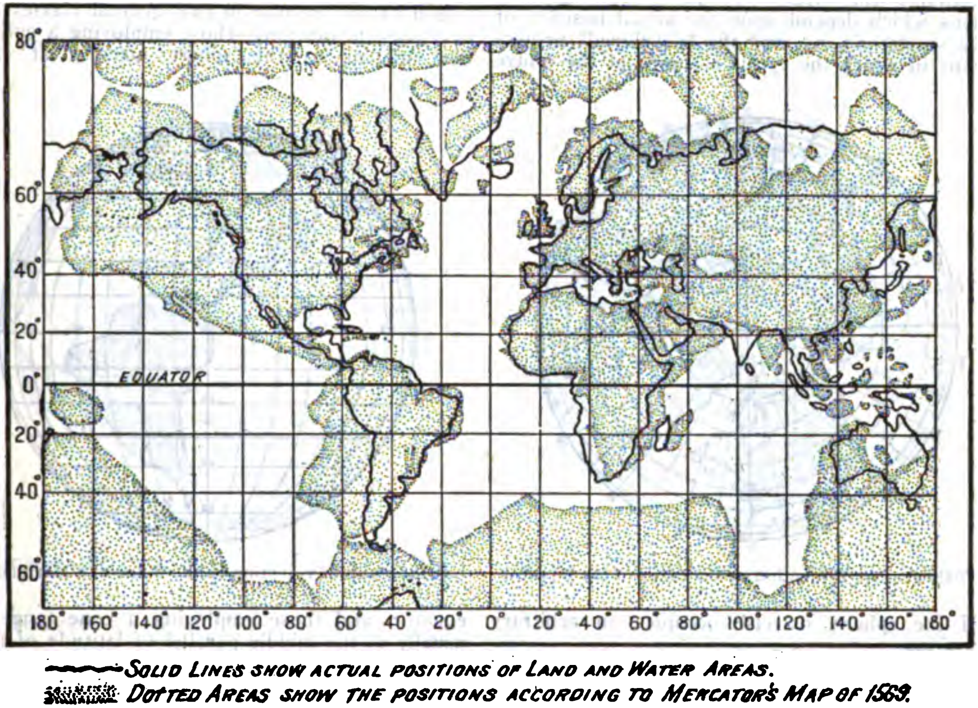
During the earlier Middle Ages, cartography together with all the other branches of scientific culture took a step backwards. The ban of the church was laid heavily on the doctrine of the sphericity of the earth and resulted in the resurrection of the ancient Greek idea of a flat circular earth surrounded by an ocean limited by the edge of the celestial vault. In this way the few maps constructed during this period assumed the form shown in the accompanying figure, and towards the close of the 14th century, the entire science of map making actually fell below the level of that attained by the Ionic Greeks in the days of Anaximander and Democritus. It is a fact worth noting, however, that during the 13th century, a form of nautical charts called «loxodromic» or «compass» maps made their appearance in Italy and were extensively used for navigating purposes between the ports on the shores of the Mediterranean Sea. They were constructed with the aid of the compass and consisted of numerous straight lines which radiated from each port to all the other ports shown on the map. These lines marked with bearings and distances gave the ship courses between the various ports, and the maps embodied in a crude way the basic principle of modern map construction from the data obtained by the triangulations of trigonometrical surveys. With the aid of the loxodromic maps a very accurate representation of the coasts of the Mediterranean countries was obtained and served admirably to correct the errors of the Ptolemaic maps which the Renaissance had introduced once more into western Europe.



Portion of Loxodromic Map (13th Century)

The close of the 15th century witnessed a great revival in the art of map making, which was materially aided by the newly perfected arts of wood and copper engraving. Furthermore, Purbach, Regiomontanus, and others introduced trigonometry, and attempts were made to construct maps based on systematic geographical triangulations. Map making became a favorite occupation with the Germans, French, and Italians, and many valuable editions of maps were produced at Strasburg, Ulm, Basle, Cologne, Paris, Lyons, Vicenza, Venice, Bologna, and Rome, representing the work of numerous eminent map makers, among which those of Joh. Ruysch, Nicolaus Donis, and Jacob Angelus de Scarparia were of especial prominence and value.

During the 16th century the number of map makers increased greatly and brought forward such illustrious cartographers as Johann Werner of Nuremberg, Sebastian Cabot, and Gerhard Kramer (more commonly known as Mercator). The general endeavor of the Germans during this period was directed towards the improvement of the methods of projection originated by the Greeks, and led in the case of Mercator to the development of the projection which bears his name, and which is even at the present time very extensively used in the construction of nautical maps. About the latter part of the century the centre of map making effort was transferred to Holland, mainly through the influence of the collection of maps published by Abraham Ortelius of Antwerp, under the title 'Theatrum Orbis Terrarum,' which included new engravings of the best maps from all countries. This great work passed through many editions, each successive edition being characterized by an increased number of maps. The 12th edition contained 92 maps. The earlier editions were printed in Latin, but later, editions in German, French, Dutch, Italian, and English were produced and obtained world-wide circulation.


80°
60°
40°
20°
0°
20°
40°
60°
EQUATOR
180° 160° 140° 120° 100° 80° 60° 40° 20° 0° 20° 40° 60° 80° 100° 120° 140° 160° 180°
SOLID LINES SHOW ACTUAL POSITIONS OF LAND AND WATER AREAS.
DOTTED AREAS SHOW THE POSITIONS ACCORDING TO MERCATOR'S MAP OF 1569.

Mercator's Map Compared with Actual Positions

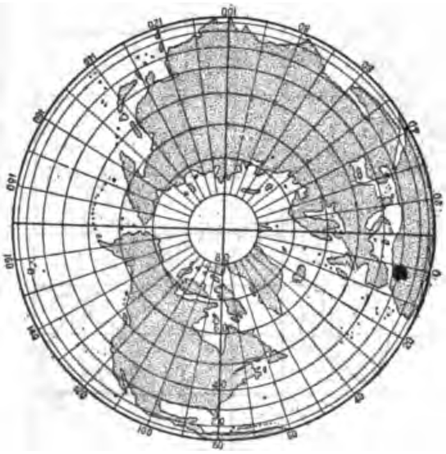
The beginning of the 17th century inaugurated a still further improvement in the art. The important inventions, such as the telescope, the sextant, and the chronometer, provided means for the taking of more accurate observations relative to time, latitude, and longitude, while the application of trigonometry to geodesy by Snellius, and Picard's measurement of a degree of the meridian between Paris and Amiens, introduced more precise methods of computation. Some of the most important productions of this epoch are those of Johann Baptist Homann of Nuremberg, and the work of Nicolas Sanson, Guill de l'Isle, and Jean Baptiste Bourgignon d'Anville and other eminent geographers of France working under the royal patronage, and Dowets Atlas published in England under the patronage of the Duke of Argyle.

These important works carry the art of map making through a period of over 200 years and bring it to a point where instead of being treated as a matter of private business enterprise, it was taken up as a governmental matter, and the original surveys, together with the maps based thereon, were executed at the cost of the state. The first step in this direction was taken by France, the object being the production of a series of maps for military purposes and as a cadastre for the land tax. For this purpose the entire country was covered with a network of triangles connecting numerous stations the positions of which were astronomically determined. The maps constructed from the data thus obtained far surpassed in the correctness of detail all those of earlier date. The example set by France has been followed by all of the first class nations of the world, and by some of lesser importance. In Europe, practically the whole continent with the exception of the Balkan States have been surveyed and mapped at the expense of the governments of the various countries. Outside of Europe, the principal large areas covered by surveys based on exact triangulations are the United States, a part of the Dominion of Canada, the whole of British India, a portion of Asiatic Russia, and small portions of Australia, South Africa, the Dutch East Indies, and Algeria. In South America, Chili is the only country that has been completely surveyed.

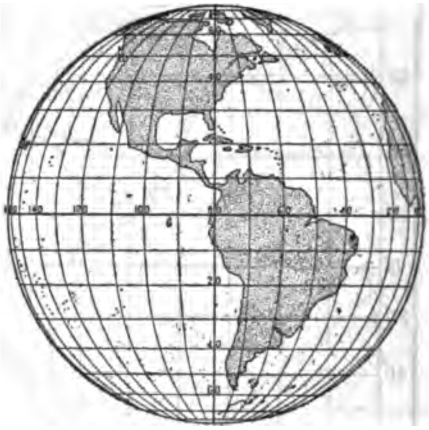
The science and art of modern map construction may be considered most conveniently and usefully under three headings—theoretical projections, practical methods of construction, and duplication or reproduction.

Theoretical Projections.—Since the object of maps and charts is to accurately represent by suitable symbols on a plane surface the relative positions of objects, etc., on the spherical surface of the earth, the problem requiring solution is one that is geometrically impossible, and therefore, any map, no matter how accurately constructed, must necessarily be only an approximation to the truth. Yet by the assumption of certain lines of reference which correspond to the actual latitudes and longitudes on the surface of the earth according to certain assumed or fixed geometric laws, the approximation to the truth may be so nearly attained as to be quite as useful as the truth itself for all practical purposes. Such a system of lines of reference constitutes a projection by means of which any point or line on the surface of the sphere may be plotted on the map from its known co-ordinates, or from which the co-ordinates of any plotted point may be ascertained.

There are two general classes of such projections:—the «true» or «perspective» projections which depend upon the actual position of the spectator's eye, and the «developed» projections in which the eye is assumed at the centre of the sphere, or else occupies an arbitrary position.



Orthographic Projection on the Plane of the Equator



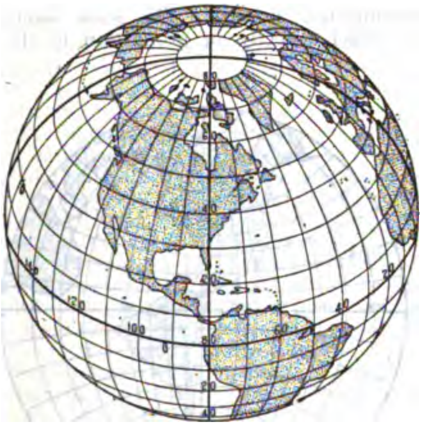
Orthographic Projection on the Plane of a Meridian

Perspective Projections are of three kinds: (1) the «orthographic,» with the eye supposed at an infinite distance, and the plane of projection perpendicular to the line of sight; (2) the «stereographic,» with the eye supposed upon the surface of the sphere and occupying the pole of a great circle, the plane of which is the plane of projection; and (3) the «gnomonic» or «central» projection, with the eye assumed at the centre of the sphere and the plane of projection tangent to its surface. To this class belongs also the globular or equidistant projection designed to avoid to a certain extent the contraction of the orthographic and the exaggeration of the stereographic projections near their respective outer edges. In this projection the eye is supposed at a distance of $\sqrt{\frac{1}{2}}$ times the radius above the surface of the sphere. The perspective projections, in their astronomical and geographical application, are generally used for representing large areas and hemispheres, and are seldom used in the construction of maps of small extent on large scales, in which case they are too laborious of construction, and cannot be made to satisfy any special conditions not included within the scope of their inherent characteristics. The three principal perspective projections were known to the ancients, the orthographic and the stereographic being accredited to Hipparchus and the gnomonic to Thales. The globular projection was devised by Nicolisi. They served to introduce projection methods, but with the exception of the gnomonic, which is still used for the construction of star charts and some classes of nautical charts, they have been superseded in the construction of modern maps by the developed projections.

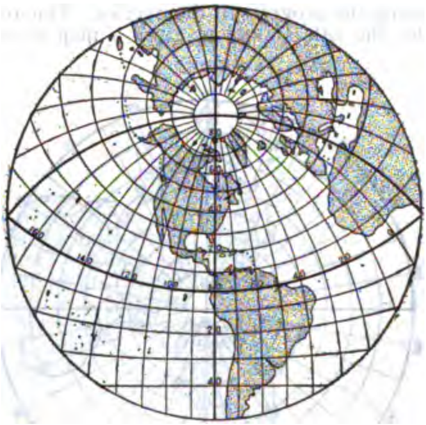
Developed Projections are obtained by the substitution of a cylindrical or a conical surface for the ordinary plane of projection, and that surface, being subsequently developed or rolled out in a plane, gives the projection. The application of this results in two general classes of developed projections—those employing a cylinder tangent to the sphere, usually at the equator, and those employing a cone tangent, usually at the middle parallel of latitude of the area mapped. Of these, the two most commonly used at the present time are the Mercator and the polyconic projections, the former employing a tangent cylinder and the latter an infinite number of tangent cones. The Mercator was purposely designed for the use of nautical maps and is principally employed for that purpose at the present time. On a map based on this projection the loxodromic curve, that is, the course of a vessel which intersects the successive meridians at a constant angle, is represented on the map as a straight line, thus facilitating the plotting of that course from day to day during the progress of the voyage, and materially assisting in determining the true distance and bearing of the objective point. The polyconic projection appears to have been devised for the purpose of providing a suitable base for the mapping of the Atlantic coast line of the United States by the United States Coast and Geodetic Survey. The direction of this coast line being nearly diagonal to the meridians and parallels, and having a great north and south amplitude, required for its representation a projection which avoided the inherent distortions of the various conic projections due to the great obliquity of the intersections of the meridians and the parallels in the higher latitudes. This projection on account of the close similarity of the figures on the surface of the earth to the corresponding figures on the projection, and the uniformity of scale over the whole map, is now extensively used for mapping not only areas of comparatively limited extent, but also for the representation of continental areas of large extent.

For the mathematical operations involved in the computation of the elements of these projections, and for illustrations showing how they are plotted in the actual construction of maps, see article under the title PROJECTION in this Encyclopedia.

Practical Methods of Construction.—As a rule, and with but a few exceptions, the drawing of an accurate map is necessarily preceded by an accurate survey of the things to be mapped, and the character of those things together with the purposes for which the survey is made, not only define the methods of surveying to be employed, but also the character of the map and its relative scale. The various methods of surveying are described under the title SURVEYING in this Encyclopedia. The various kinds of maps may be grouped into the following named general classes: «Geographical,» «physiographical,» «topographical,» and «geological» maps. The representations of astronomical, hydrographical, nautical, and statistical data belong more properly to the category of charts. The various forms of railroad maps are merely diagrams only useful for consultation with the accompanying railroad schedules. The amount of distortion required to fit them for the purposes for which they are used makes them entirely unreliable for any other purpose. The military maps are of various types, and differ greatly according to the purposes for which they are used. Staff maps usually show every feature, natural and artificial, on the surface of the country mapped in the minutest detail and with the greatest accuracy. The differences of elevation of the various points are a matter of the greatest moment, and therefore, are usually treated in the most complete manner both as to graphic effect and accuracy of information. The sketch maps are much simpler in character and represent in the most elementary way the most important features which have a direct bearing on the particular kind of military operations involved.



Orthographic Projection on the Plane of a Horizon



Stereographic Projection on the Plane of a Horizon

Many good examples of the various classes enumerated are incorporated in this Encyclopedia, a few of which may be profitably mentioned for ready reference in this connection as follows:

Geographical.—The maps of the several states and territories of the United States and the Canadian Provinces represent comparatively limited areas based on the polyconic projection, and are reproductions by the wax engraving process. The maps of the various continents represent larger areas based on the same projection, and have been reproduced by the same process. Several fine examples are given under the titles AMERICA, EUROPE, ASIA, etc. A map of the north polar region based on the simple conic projection is given under the title ARCTIC REGION. The map of the south polar region given under the title ANTARCTIC REGION is based on the orthographic projection, A map of the world based on Mercator's projection is given under the title UNITED STATES—TERRITORIAL EXPANSION OF.

Physiographical.—Excellent examples of this class are given under the titles NORTH AMERICA, SOUTH AMERICA, EUROPE, ASIA, and AFRICA. They represent the various mountain ranges, valley formations, and river systems of those important land areas. Some of the other interesting examples are the maps showing the lengths and locations of the proposed Nicaragua and Panama canals, under the title CANALS; the map of the Hawaiian Islands under the title HAWAII, and the map of the island of Luzon, under the title LUZON.

Hydrographical.—A type of hydrographic map of an extensive area on a small scale, and showing the form and direction of the ocean currents is given under the title OCEAN. An example of a small portion of a hydrographic map such as those prepared by the United States Coast and Geodetic Survey is given under the title Coast and Geodetic Survey, Methods and Publications of.

Topographical.—Among the best examples of modern topographical maps are those prepared by the United States Geological Survey. An example of a portion of one of these maps is given under the title Geological Survey, Methods and Publications of. In the original map the roads, railroads, villages, towns, cities, and other artificial features are usually printed in black; the contours indicating the valleys and the hills and mountains are printed in brown; and the hydrography and river systems are printed in blue.

Geological.—The article under the title Geology gives a geological map of the United States based on the polyconic projection and reproduced in colors by the lithographic process.

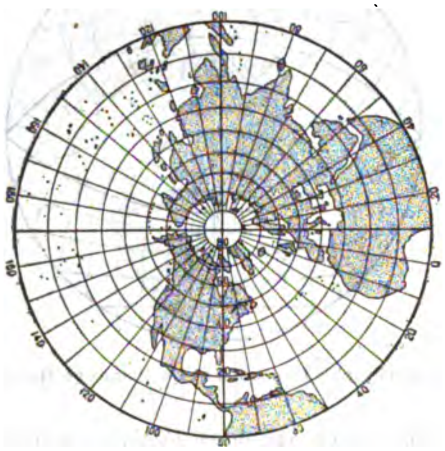
Statistical.—The article under the title Geographical Conquests gives the maps of Africa, the North Polar Region, and North America, showing the progress of discoveries. The article under the title Carnegie gives a map showing the location of the libraries presented by Mr. Andrew Carnegie to various towns and cities in the United States. The title Civil War in the United States includes a series of statistical maps showing the extent of the Confederate possessions during various periods of the Civil War. An interesting statistical map showing the life zones of the United States is given under the title Distribution of Animals.

A study of these examples will afford a general idea of the most suitable treatment under the respective conditions, and the character of the data usually represented on the different classes of maps.

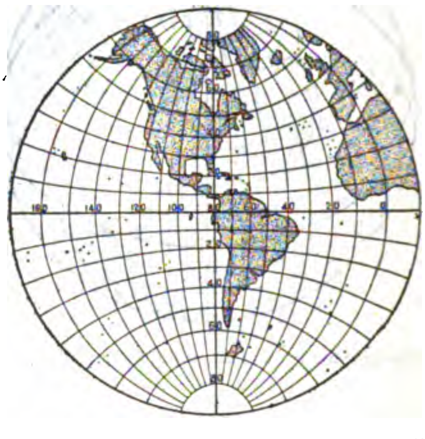
In the construction of original maps the principal points to be considered are the «scale,» the «projection,» the «topographical representation,» and the method of «duplication or reproduction» for publication.

Scale.—The scale will depend upon the character of the survey and the data obtained thereby; the extent of the area to be represented on the map; and the process by which the map is to be reproduced. The original map should always be drawn on a scale sufficiently large to allow the draughtsman to plat the field notes easily and accurately. The difference between a large scale and a small scale and their relative effect on maps may be explained as follows: Suppose the fractional scale of a map is given as $\frac{1}{63360}$ it indicates that an interval of one inch on the map is equivalent to an interval or distance of 63360 inches or one mile on the ground. Suppose the map to be ten inches square, it would include an area of 100 square miles. Now suppose that while the size of the map remains the same the scale is reduced to $\frac{1}{633600}$, it would then include an area of 10,000 square miles. Any map scale which requires that the platting of measurements be made by the use of a scale with finer divisions than one-hundredths of an inch is about the minimum limit for platting original work, although measurements requiring an accuracy of one two-hundredths of an inch are commonly made in the construction of accurate projections for the mapping of exact trigonometrical surveys. The scale should be made larger directly in proportion to the increase in the amount of detail to be shown on the map. The scales for maps in railroad work should always be large—one inch to one, two, or three hundred feet. For the platting of plane table and other triangulations, and for work requiring the filling in of a great amount of topographical detail, the scale should not be less than one inch to one mile. All surveys such as the townships and sections of the Public Land Surveys, in which the measurements are made by chain or by stadia, should not be platted on a scale less than one inch to 40 chains or half a mile.

In all cases the original maps may be subsequently reduced to any desired scale by hand, by pantagraph, or by photographic methods. Reduction by pantagraph is satisfactory and useful only for the roughest classes of work. Photographic reductions of maps of limited size and prepared as copies for engravings, may be made with fair accuracy and very slight distortion. Map sheets exceeding 15 to 20 inches square in the size of the final reduction



Stereographic Projection on the Plane of the Equator



Stereographic Projection on the Plane of a Meridian cannot be reduced photographically with sufficient accuracy to satisfy the demands of absolutely accurate copper, steel, and stone engravings. For such engravings the reductions should always be made by hand. The method of hand reduction usually employed is the simple but effective one of dividing the original and the copy into a system of equivalent squares and then drawing in all the details by hand. The very simplicity of the method demands the services of the most skillful and experienced draughtsmen, so that the resulting maps possess a far greater accuracy than any reductions that may be obtained by photo-mechanical methods. There are examples of hand-made maps in the office of the United States Coast and Geodetic Survey which are actually superior in accuracy, execution, and beauty, to the prints from the very fine copper engravings for which they served as a copy.

If the maps are to be reproduced by being engraved on copper, steel, or stone, the reductions furnished the engravers should always be upon the «final scale» or scale of publication. This is also applicable to wax engravings when photographic methods of reduction are not available to the engraver. When the maps represent a great diversity of physical characteristics, it is convenient to avoid confusion of details by using various conventional colors so as to distinguish the land from the water areas, the rivers and creeks from the roads, railroads, contour lines, etc. If the maps are to be reproduced by any of the photo-mechanical processes such as photo-engraving, photo-lithography, or the half-tone process, the use of colors should be strictly avoided, and the map made in black and white on a scale that will allow about a one-third reduction to the scale of publication.

Projection.—At the present time the construction of the basic projection for a map is a very simple matter, and consists merely in the laying off of the proper tabular values which have been computed for the use of map draughtsmen. The most useful tables of this kind in this country are those published by the United States Coast and Geodetic Survey, and the Hydrographic Office of the Navy Department. The Mercator and the polyconic are the two principal projections employed at the present time, but many others are often employed where their special characteristics satisfy the particular requirements of the maps. It is in such cases that an intimate knowledge of the various projections is valuable to the map maker.

For information relative to the particular characteristics of the various projections see article under the title PROJECTION.

Topographical Representation.—The differences of elevation between the various points on the surface of any region, that is, the hills, mountains, and valley formations together with other natural features such as the river systems, plains, tablelands, etc., constitute the topography of that region. The term «orography» is applied to the aspect furnished by those natural features the existence of which are due solely to differences of elevation—the valleys, hills, and mountains. These are represented on maps either by a system of horizontal lines drawn at right angles to the slopes called «contours,» or by a system of vertical lines called hachures which follow the directions of the slopes and are drawn at right angles to the «contours.» The best idea of the nature of contours may be had by supposing a dam built across a river and flooding the country above it. Suppose the height of the dam to be increased at uniform intervals of 10 feet. At each increase in the height of the dam the water will reach a new level, and the irregular horizontal line where it intersects the surface of the ground is the contour for that particular height of the dam, and connects all the points of the same elevation on surface of the whole region. In the actual determination of contours the datum, zero, or point of beginning of the vertical intervals is the level of the sea, and the value of an interval adopted—10, 20, 50, or more feet—depends upon the purpose for which the survey is made, and the scale of the final map. In surveys for hydraulic purposes such as the construction of dams and reservoirs, the laying of water and sewer systems, and the digging of canals, many cases occur which require the adoption of a contour interval as small as one or two feet. In such cases the areas surveyed are small and are mapped on a large scale. On the other hand, when the areas are large with great differences of elevation. larger contour intervals are adopted, and the maps are made on a small scale. The maps of the United States Geological Survey are among the best examples of orographic delineation by the method of contours, for detailed information of which see article under the title GEOLOGICAL SURVEY.

The delineation of orographical features on the more accurate and useful classes of maps by the method of hachures is now being rapidly supplanted by that of contours. The only practical value of the former lies in its pictorial effect, and that, when viewed from the standpoint of usefulness, fails to compensate for the enormous expenditure of labor and time in the execution of the maps and the subsequent engravings. The most beautiful examples of this class of maps in the world are those that have been published from time to time by the United States Coast and Geodetic Survey, but even in the work of that bureau, the method of hachures is being slowly supplanted by the method of contours.

Duplication or Reproduction.—Maps are duplicated or reproduced for publication by being engraved by hand on copper, steel, stone, wood, and wax. Wood engravings, however, are very rarely made at the present time. Maps are also reproduced quite extensively by the photo-engraving and the photo-lithographic processes. The finest classes of engraved maps, like those of the United States Coast and Geodetic Survey, are impression prints taken directly from the engraved plate by means of hand presses. In this bureau the engravings are made exclusively on copper plates. The maps of the United States Geological Survey, which represent the finest class of lithographed maps in this or any other country, are engraved on stone, from which impression prints are taken on hand presses and transferred to smooth stones from which the final prints are made on power-driven cylinder presses. A great many of the maps which make up the best classes of atlases published for scientific and other purposes in foreign countries are reproduced in the same manner. In the United States the commercial maps are mostly reproduced by the wax engraving process. This process has now become one of the most important methods for reproducing not only maps, but also for the reproduction of any subject in line, such as statistical diagrams, architectural plans, mechanical drawings, etc., for the illustration of books, magazines, and catalogs.

For detailed information relative to the various processes enumerated, see articles under the titles, ENGRAVING, LITHOGRAPHY, PHOTO-ENGRAVING, PHOTO-LITHOGRAPHY, and WOOD-ENGRAVING.

For further detailed information on maps and map making methods consult the following authorities: Craig, 'A Treatise on Projections' (U. S. Coast and Geodetic Survey, Washington 1882); Gelcich and Sauter, 'Kartenkunde geschichtlich dargestellt' (Stuttgart 1897); Gretschel, 'Lehrbuch der Kartenprojektion' (Weimar 1873); Verner, 'Map Reading and Elementary Field Sketching' (London 1893); Zondervan, 'Allgemeine Kartenkunde' (Leipzig 1901); West, 'The Elements of Military Topography' (London 1894); Woodward, 'Geographical Tables' (Washington 1894); Steinhauser, 'Grundzüge der mathematischen Geographie und Landkartenprojektion' (3d ed., Vienna 1887); Fiorini, 'Le projezioni delle carte geografiche' (Bologna 1881); Cebrian and Los Arcos, 'Teoria general de las proyecciones geográficas' (Madrid 1895); Tissot, 'Mémoire sur la représentation des surfaces et les projections des cartes géographiques' (Paris 1881).

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Mapes, māps, **Victor,** American playwright: b. New York 10 March 1870. He was graduated from Columbia in 1891, was Paris correspondent of the New York *Sun* 1892–6, and dramatic critic of the New York *World* 1898–9. He has written 'Duse and the French' (1897); and among plays by him may be named: 'A Flower of Yeddo' (1898); 'The Tory's Guest' (1900); 'Don Cæsar's Return' (1901).

Maple, a genus (*Acer*) of trees, together with a few shrubs of the order *Sapindaceæ;* or according to some botanists, the type genus of the order *Aceraceæ*. The species, of which there are nearly 100, are indigenous to the North Temperate zone, being most numerously represented in China, Japan, the United States and Canada. They are characterized by opposite, palmate or lobed, exstipulate leaves; small polygamo-diœcious flowers in axillary corymbs or racemes; and compound, one- or two-seeded, long-winged nuts (samaras). The maples constitute one of the most widely useful genera of trees, being extensively employed for ornamental and street planting, for wind-breaks, while the wood serves well for tool-handles, furniture, flooring, and many other purposes. As fuel, they are especially valuable, being considered superior to almost all other woods except hickory. Because of their popularity for ornamental planting a great number of horticultural varieties have been produced, especially in Japan, and nearly all, but particularly the Japanese and American species and varieties, are noted for their brilliant autumnal colorings, which in the various shades of yellow and red are unequaled by any other group of northern trees. The flowers are rich in nectar and are sought by bees. Most of the species thrive best upon rich moist land suitable for agricultural purposes and are considered an indication of the type of soil. A few grow in wet land, and many upon mountain sides. They are readily propagated by means of seeds which, in the case of the early maturing kinds, should be sown as soon as ripe, the later ones in autumn or spring, being stratified in sand during the winter. Some choice varieties are grafted or budded and others may be increased by cuttings and layers.

In America, the best known, most widely planted and otherwise most important species is probably the rock or sugar maple (*A. saccharinum* or *A. saccharum*), a stately round-headed, gray-barked tree often attaining heights of 120 feet. It is especially characteristic of rich woods from Maine to Michigan and southward in the mountains to Georgia, everywhere being noted for the surpassing splendor of its leaves in autumn. Besides great popularity for all the purposes mentioned above, some of its specimens are highly prized for their wavy grained wood, which being of satiny appearance and capable of high polish is used under the name of curly maple often as veneers for choice furniture. It is further the most important of the species which yield a saccharine sap, and is a chief source of maple syrup and sugar, to obtain which the trees are «tapped,» the sap caught in buckets and evaporated. A yield of three pounds annually is considered very profitable; six pounds or even more is often obtained from many specimens whose sap is either especially abundant or particularly rich in sugar. If properly done no injury results to the trees. One of its varieties, the black maple (*A. saccharinum*, var. *nigrum*) so called from the color of its very dark-colored bark, is considered a distinct species (*A. nigrum*) by some botanists. It has the same range and habitats as the preceding and in nearly every respect the same uses, including sugar production. This form is more abundant than the preceding in the Central States.

The silver maple (*A. dasycarpum;* or according to Linnæus, *A. saccharinum*) is a widely spreading tree which attains a height of 120 feet throughout the same range as the above species. Being very ornamental in form and particularly also because of its graceful leaves, which are silvery white beneath, this tree is widely planted where rapid growth and quick effects are desired. Its chief fault is its brittleness; it quickly succumbs to high winds. It will succeed upon a wide variety of soils. Its sap, though rather sweet, is less useful for sugar than the above mentioned species.

The red, scarlet or swamp maple (*A. rubrum*) attains heights similar to the above, has about the same range, but is most frequently found in wet ground. It is named from the brilliant color of its flowers, which are borne profusely in early spring before the leaves appear and its red fruits which appear soon after. Being of good habit it is widely planted for ornamental purposes upon all kinds of soils. Its wood is used for most of the purposes enumerated above.

The Norway maple (*A. platanoides*) is somewhat smaller than the preceding species, being more compact and umbrageous. It is widely planted in private grounds and in parks, but is less valuable for street planting than the above because of its shorter trunk. It is a native of

Europe. The sycamore maple (*A. pseudo-platanus*) another European species is smaller still, attaining only about 70 feet. It is also widely planted in America as well as in Europe, being a vigorous, rapid grower and succeeding upon a great variety of soils. The common maple (*A. campestre*) occasionally attains 50 feet, but is usually a smaller tree or even a shrub. It is of European origin and is widely planted.

The Japanese maples (*A. japonicum* and *A. palmatum*) are both small trees or shrubs which because of the great diversity of form of their leaves, and their dainty habit have become widely popular in the parks and gardens of the United States and Europe. Their exceptionally brilliant autumnal coloring is taken advantage of in Japan where in the fall they approach the chrysanthemum in popularity.

There are many other species but these are the most important. Another group, the ash-leaved maples, are generally grouped under the generic name *Negundo*. The best known representative is the box-elder (*A. negundo* or *Negundo aceroides*), which is widely planted in the Western States for wind-breaks and shelter belts and for fuel.

The maples furnish food for a large number of insects, some of which live upon the green parts, and others upon the wood. Several species of scale insects (q.v.) are often abundant enough to do considerable damage. The cottony maple scale (*Pulvinaria innumerabilis*), *Pseudococcus aceris*, a European insect, and the «gloomy» scale (*Aspidiotus tenebricosus*), a southern species, are among the most troublesome. Several caterpillars live upon the leaves, the forest tent caterpillar (*Malacosoma disstria*), the fall web-worm (*Hyphantria cunea*), and the larvæ of the tussock moth (*Orgyia leucostigma*), being the most generally important. The maple worm (*Anisota rubicunda*) is frequently very destructive. It is the larva of a moth. Of the borers, the larvæ of *Dicerca divericata*, and *Glycobius speciosus*, which are beetles in the adult state, and those of *Ægeria acerni*, a clear winged moth, are among the best known. The second beetle mentioned is known as the sugar maple borer. Consult: ‘Bailey, Cyclopedia of American Horticulture,’ New York (1900–2).

Maple Sugar Industry, a trade term, in common use, pertaining to the manufacture of sugar and syrup from the sap of rock or sugar maple, *Acer saccharinum*. This production is classed under «Agriculture» by the United States Census Bureau, and note was made of its importance at a very early day in the history of the government. The product is strictly confined to North America, and the greater part to more or less limited areas in each of the geographical divisions known as New England, the Middle and Central-Western States, and Canada bordering on the North. Twenty-three States reported maple sugar or syrup in 1900. Of the 11,928,770 pounds of sugar made that year in the United States, 87.8 per cent, or 10,478,240, were produced in the North Atlantic States. The three States of Vermont, New York, and Pennsylvania reported over 80 per cent of the total. On the other hand, the States of the North Central division were credited in 1900, with 1,211,334 gallons of syrup, out of a total of 2,056,611 for the entire country. In this division the great maple sugar producing States of Ohio, Indiana, Michigan, and Wisconsin are included. The importance of this industry may be inferred by the tables following, taken from the census years noted,—the five States reporting the greatest production in 1900, being arranged in order of precedence and compared with the total manufacture:

POUNDS OF SUGAR.

STATES	1900	1890	1860
Vermont	4,779,870	14,123,921	9,897,781
New York	3,628,540	10,485,623	10,816,419
Pennsylvania	1,429,540	1,651,163	2,767,325
Ohio	613,990	1,575,562	3,345,508
New Hampshire	441,870	2,124,515	2,255,012
Total	10,893,810	29,960,784	29,082,045
Total, U. S. A.	11,928,770	32,952,927	40,120,205

GALLONS OF SYRUP.

STATES	1900	1890	1860
Ohio	923,519	727,142	370,512
New York	413,159	457,658	131,843
Indiana	179,576	180,702	292,908
Vermont	160,918	218,252	16,253
Pennsylvania	160,297	154,650	114,310
Total	1,837,469	1,738,404	925,826
Total, U. S. A.	2,056,611	2,258,376	1,597,589

It is estimated that it costs 5 cents per pound to manufacture maple sugar or syrup. On this basis the cost of syrup will average 55 cents per gallon. In 1900 the valuation reported was: sugar, 9 cents per pound; syrup, 76 cents per gallon. In Canada the manufacture of maple sugar and syrup has assumed a relatively high importance compared with the production in the United States. The Dominion census of 1901, gives the entire volume as 17,762,636 pounds (syrup being reducted to equivalent pounds of sugar for the purposes of this enumeration); and, of this aggregate, the Province of Quebec is credited with 13,643,672 pounds of maple sugar, the Province of Ontario following with a production of 3,791,598 pounds. Maple sugar is reported from other provinces and territories as follows: New Brunswick, 207,450 pounds; Nova Scotia, 112,496 pounds; Manitoba, 5,137 pounds; Northwest Territories, 1,243 pounds Prince Edward Island, 1,009 pounds; British Columbia, 31 pounds. The average value of this maple sugar and syrup is 10 cents per pound.

History.—Maple sugar and syrup was made at an early day by the pioneers of New England and Canada. It may have been a product of «necessity, the mother of invention,» or an inheritance from the Indians, who had a spring-date of *sugar-making moon*; but, in either event, the first methods employed were crude, and the article was dark in color and not attractive. Moreover, tapping trees with an axe tended to denude the forest of its maples, and the whole *modus operandi* was wasteful in the extreme. The sap was caught in troughs, hewed out of logs, thence carried in pails to the boiling-place, and reduced to syrup in potash kettles. These kettles of the 18th century, or earlier, would be a curiosity at this day. They were suspended by chains from a horizontal pole, supported by forked or crossed sticks at each end, and surrounded by a blazing open fire. The camp-kettle, captured from General Burgoyne at the Battle of Saratoga, 17 Oct. 1777, preserved in the Bennington Battle Monument, is a fine illustration of what these kettles resembled. Primitive ways, however, did not long continue. Improved methods, both as to tapping the maples,— leading up to the use of metal spouts, — and refining sap, followed one another, until now, modern scientific principles prevail; and it is possible to reduce the sap to sugar or syrup, using evaporators, almost immediately, so that its color is nearly white, flavored only with the delightful aroma of the maple.

Production and Adulteration.— The demand, in the United States, being many times in excess of the natural production, maple sugar and syrup must be considered a luxury. This fact has led to the «manufacture» of an article of commerce in which the pure maple product plays a very inconsequential part. Good authorities assert that sugar refiners make much more sugar and syrup, labeling it «maple,» than the entire natural production; that the refuse sugar of the real maple enters into the artificial combination of glucose, cane or beet sugar, and chemicals,— to a very large degree creating a ready market for black American and Canadian sugars, and the «late runs» of the maple sugar-producing sections of both countries.

Maple Sugar Makers' Associations.— In the more important States, organizations have been formed for the mutual protection of common interests. These associations comprise in their membership the larger producers of maple sugar, and not infrequently, include State officials and their respective delegations in Congress. Influenced by these representatives of material interests to State and Nation, the United States government, through its Department of Forestry, has instituted a series of experiments for the purpose of fostering the maple sugar industry of the United States; to devise means for a more successful propagation of the sugar maple, and to enhance the quantity, quality, and value of the «orchards» now in existence.

H. L. STILLSON.

Mapleson, mā'pl-sŏn, **James Henry,** English operatic impresario: b. London 4 May 1830; d. there 14 Nov. 1901. He was educated at the Royal Academy of Music, London, and went to Italy for vocal instruction, but was compelled to abandon his career as a singer, owing to throat trouble. He then entered an orchestra, playing the viola and in 1861 he became manager of the Lyceum Theatre. In 1862 he assumed the management of Her Majesty's Theatre where he made himself famous. In 1871, after the burning of Her Majesty's Theatre he managed Drury Lane but returned to the new Her Majesty's upon its completion. In 1878 he conducted the tour of an Italian opera in America and subsequently made tours with the greatest singers of the day, including Patti, Nilsson, etc.

Mapurito, mä-poo-rē'tō, one of the Mexican white-backed skunks. See SKUNK.

Maqui, mä'kwē, an evergreen shrub of the linden family found in Chile, from the juice of whose acid fruit the Chileans make a wine given to persons ill with a fever. Its wood is employed in making musical instruments, and its bark furnishes strings for them. It is the best-known species of the genus *Aristotelia* (*A. maqui*), and is cultivated as an ornamental shrub in Europe.

Maquoketa, mạ-kŏ'kē-tạ, Iowa, city, county-seat of Jackson County; on the Maquoketa River, and on the Chicago, M. & St. P. and the Chicago & N. W. R.R.'s; about 40 miles northwest of Clinton and 30 miles south of Dubuque. It is in an agricultural section; valuable limestone quarries are in the vicinity, and not far distant are forests which furnish excellent hardwood timber. Its chief manufactures are flour, lime woolen goods, brick, tile, foundry and machine-shop products, and wooden-ware. It has an extensive trade in manufactured articles, farm products and livestock. It has county buildings, several churches and schools, and the Boardman Library Institute. The city owns and operates the waterworks. Pop. (1910) 3,570.

Mara, mä'rạ, in old Runic, a goblin that seized on men asleep in their beds, and took from them all speech and motion. In Russian it was called *kiki-mora*, or ghost. Mara is another representation of incubus or nightmare (qq.v.).

Marabou, măr-ạ-boo', a large African pink-white pouched stork (*Leptoptilus crumenifer*), which resembles the adjutant (q.v.) of India in appearance and habits. It gives its name to the soft and drooping feathers (coverts) which cover the root of the tail and are prized for millinery and other ornamental purposes; a large part of the «Marabou feathers» sold, however, are derived from the Indian adjutant.

Marabouts, măr'ạ-boots, **Maraboots,** or **Marabuts,** an Arab tribe of religious devotees, saints or sorcerers, who are held in high estimation, and who exercise in some villages a despotic authority. They distribute amulets, affect to work miracles, and are thought to exercise the gift of prophecy. Throughout the Barbary States the tombs of the Marabouts are conspicuous objects, being generally built in the open country, and regarded by the people with much reverence. The living Marabouts are regarded by foreigners as little better than vagabonds.

Maracaibo, mä-rä-kī'bō, Venezuela, capital of the state of Zulia; situated on the western shore of Lake Maracaibo; has a large and safe harbor; and maintains commercial relations with foreign markets, with the interior, and with Colombia. The Red «D» Line Steamship Company, of New York, sends a vessel on regular trips to Maracaibo, and hundreds of small craft, suitable for shallow waters, carry on the trade of the coast and rivers tributary to the lake. This city is also the starting point for passenger and freight steamers and the railway lines of sections of the state of Los Andes. The most important buildings are the Executive Mansion, the public market, Legislative Palace, Municipal Building, Baralt Theatre, University, six churches, and the new jail. There are 5 hotels, 2 clubs, 24 restaurants, etc. The public plazas contain statues of the patriot, Gen. Rafael Urdaneta, and Don Rafael Baralt, author of a history of Venezuela, who was born in Maracaibo and became a member of the Royal Spanish Academy. There is a dockyard for the construction of sailing-vessels, and the city has electric lighting, telegraph and telephone service, submarine cable, street railways, etc. In 1901, its exports were: coffee, 25,626,000 kilos; cocoa, 154,000 kilos; hides, 456,000 kilos; deer and goat skins, 147 tons; copaiba, 41 tons; fustic, 6,272 tons; dividivi, 3,368 tons; brown sugar, 283 tons; fish sounds, 36 tons. The number of vessels entering this port in the year just mentioned was 431. Maracaibo, at first called Nueva Zamora, was founded in 1571 by Alonzo de Pacheco. The population numbers more than 45,000.

Maracaibo, Gulf of. See Venezuela, Gulf of.

Maracaibo, Lake of, Venezuela, in the northwestern part, connected with the Gulf of Venezuela by a strait about 50 miles long and from 8 to 15 miles wide. The lake is about 100 miles long and 80 miles across the widest part. At the mouth it is about 500 feet deep, but at its head it is shallow and the land near the shore is marshy. Large vessels cannot enter because of a bar at its mouth which leaves only from 8 to 13 feet of water. A number of rivers flow into the lake and keep it fresh, but when strong north winds prevail it becomes brackish. The tides do not affect the lake to any very great extent although it is a marine inlet. It was once much larger than at present, as the shore-marks indicate, but the basin has been filled in leaving this one large lake and a number of smaller lakes which are connected by creeks. See also Venezuela.

Marajo, mä-rä-zhō', Brazil, an island at the mouths of the Amazon and Para rivers; area, about 18,000 square miles. The greater part is low, in the centre are several lakes. In the north and west are swamp lands and in the east and south forests, the rubber tree predominating. The chief settlement is Sauré on the eastern coast. There are not many residents, as in the rainy season nearly the whole island is flooded. Cattle raising and gathering rubber are the chief occupations.

Maral, the red deer of Persia.

Maranham', mä-rän-yän, or **Maranhão,** Brazil, a maritime state, bounded on the north by the Atlantic Ocean; area, 177,566 square miles. The surface is uneven, but there is no range of mountains. There are numerous rivers flowing into the Atlantic, large forests, extensive plains where cattle are reared; the climate is fine, and the soil fertile. Paranahyba is the principal river. Agriculture, however, has not prospered here, and the emancipation of the slaves, on whose labor the state had depended, was followed by a period of great depression. Cotton, sugar, and rubber are the principal products. Coffee, rice, corn, cacao, and tropical fruits grow luxuriantly. The population is not great enough to properly develop the rich natural resources. Efforts are being made to colonize different sections. The present inhabitants are chiefly of Portuguese descent; but there are about 20,000 Indians and a few hundred negroes and mulattoes. The capital is Maranham. Pop. about 450,000.

Maranham, or São Luiz De Maranhão, sän loo-ēzh' dō mä-rän-yän', Brazil, capital of the State of Maranham; on an island on the bay of São Marcos, and between the mouths of the Itapicurú and Mearim rivers. The first settlements were made by the French in 1612. The ground is low and the climate warm but the place is healthful. The harbor, once good, is filling with sand, and little or nothing is done for its improvement. It has considerable trade: the chief exports are cotton, sugar, hides, rubber, cotton-seed, and the skins of goats. The chief imports are cloths and clothing. The city has many fine buildings, public and private. Pop. including the suburbs, about 40,000.

Maranhão. See Maranham.

Maraschino, mär-äs-kē'nō, or **Marasquino,** a fine liqueur prepared from the sour cherry of southern Europe (*Prunus mahaleb*). The best-known kinds come from Dalmatia, and from Corsica. An inferior kind is made in Germany.

Marat, Jean Paul, zhŏn pōl mä-rä, French revolutionist: b. Boudry, Neuchâtel, Switzerland, 24 May 1744; d. Paris 13 July 1793. He studied medicine in Paris, traveled widely, and practised in London and later in Paris. The first breath of the Revolution converted the industrious doctor into an audacious fanatic and demagogue. He succeeded, by his violence and energy, in commanding attention. Danton instituted the club of the Cordeliers, and collected around him all the fiercest spirits; among the number, Marat, who became the editor of the 'Publiciste Parisien,' better known under its later title 'L'Ami du Peuple,' again changed to the 'Journal de la Republique Française.' This sheet was the oracle of the mob. Denounced to the constitutional assembly, and proceeded against by the municipal authority of Paris, he contrived to escape to London and was later in hiding in Paris. During the existence of the legislative assembly he continued his outrages, figured among the actors of 10 August, and in the assassinations of September (1792). He was a member of the committee of public safety to the convention and made the ministers, General Dumouriez, and the Girondists, the objects of his attack. Being charged in the convention with demanding in his journal 270,000 heads, he openly boasted of that demand, and declared that he should call for many more if those were not yielded to him. The establishment of the revolutionary tribunal and of the committee for arresting the suspected, was adopted on his motions. On the approach of 31 May, as president of the Jacobin Club, he signed an address instigating the people to an insurrection, and to massacre all traitors. Even the Mountain party denounced this measure and Marat was delivered over to the revolutionary tribunal, which acquitted him; the people received him in triumph, covered him with civic wreaths, and conducted him to the hall of the convention. His bloody career was closed by assassination. (See Corday, Charlotte.) His remains were placed in the Pantheon, whence they were later removed. Consult Chevremont, 'Jean Paul Marat' (1881); Bat, 'Jean Paul Marat, the People's Friend' (1901).

Marā'thī. See Mahrattas.

Marathon, mär'a-thŏn, Greece, an ancient village in Attica, about 20 miles northeast of Athens. It was situated on a plain which extends for about 6 miles along the sea shore, with a breadth of from 1½ to 3 miles. The site of the ancient village was not probably that of the present Marathona, but at a place now called Vrana, a little farther south. Through the centre of the plain runs a small brook. Here was fought the great battle between the Athenians and Persians, 490 B.C. (See Miltiades.) A tumulus or «soros» on the plain, marks the burial-place of the Athenians who died in battle. It was excavated by the Greek Archæological Society in 1890–1, and yielded many interesting relics.

Maratti, mä-rät'tē, or **Maratta,** mä-rät'tä, **Carlo,** Italian painter and engraver: b. Camerino 13 May 1625; d. Rome 15 Dec. 1713. While a child he amused himself with painting all sorts of figures drawn by himself on the walls of his father's house. In his 11th year he went to Rome, studied the works of Raphael, of the Caracci, and of Guido Reni, in the school of Sacchi, and formed himself on their manner. His Madonnas were particularly admired. Louis XIV. employed him to paint his celebrated picture of Daphne. Clement IX., whose portrait he painted, appointed him overseer of the Vatican gallery. We are much indebted to him for the preservation of the works of Raphael in the Vatican, and of the Caracci in the Farnese Palace. He also erected monuments to those masters in the church della Rotonda. As an artist Maratti deserves the title given him by Richardson, of the «Last Painter of the Roman School.»

Maratti'ales. See FERNS AND FERN-ALLIES.

Maravedi, măr-ạ-vā'dĭ, a name given to old Spanish copper coins in use from 1474 to 1848, varying in value from 1-7 to 1-3 of a cent. There were also, at an earlier period, maravedis of gold weighing 60 grains.

Marbeau, Jean Baptiste Firmin, zhŏṅ bä-tēst fēr-măṅ mär-bō, French philanthropist, founder of the day-nursery: b. Brives 18 May 1798; d. St. Cloud 10 Oct. 1875. He practised law in Paris, and in 1841, being deputed to inspect the charitable institutions of the first arrondissement of the city, planned the crèche or day-nursery for the care of children of working mothers. The first crèche was opened 14 Nov. 1844 at Chaillot; a Société des Crèches was founded in 1846; and his plan was described in his book, ‹Des Crèches› (1845). Marbeau played a less prominent part in other charities and wrote on various problems of pauperism. Consult the life by Roussel (1875).

Mar'ble, mär'bl, **Manton,** American journalist: b. Worcester, Mass., 16 Nov. 1835. He was graduated from the University of Rochester in 1855 and engaged in journalism in Boston where he was on the staff of the *Journal* and later on that of the *Traveller.* In 1858 he went to New York and was on the editorial staff of the *Evening Post* and in 1862–76 was owner and editor of the *World.* He was a member of the Bimetallic Congress in Europe in 1885 and is the author of ‹A Secret Chapter of Political History› (1878).

Marble (from the Greek *marmairein,* to sparkle), a compact rock which, in its pure form, is composed entirely of carbonate of lime or limestone. In its best form it is a variety of calcite, the tiny crystal facets sparkling and flashing in the sun's rays; hence its ancient name. It is seldom found in perfect purity, the tractable qualities of the limestone allowing the introduction of many foreign substances during its formation. Thus there will be seen marble with streaks of various colors running through it, caused by the action of oxide of iron or other chemicals. Almost any limestone rock is commonly called marble, even certain varieties of granite, onyx, porphyry and rock largely composed of gneiss and mica-schist.

Marble has been a favorite stone for forming into statuary and for decorative work in buildings and monuments, from the very earliest ages. The Greeks, who were the first to endow this lifeless stone with marvelous genius in their statuary and bas-reliefs, were blessed with an almost inexhaustible supply of the very finest and purest marble yet discovered, on the island of Paros, in the Ægean Sea. This marble, so celebrated as «Parian,» possesses a peculiar waxy attribute which gave the statues formed from it a beautiful polish. The ‹Venus de Medici› was made from this stone, which is almost perfectly white. The Parthenon was built of marble of Pentelicus, which was a little more finely grained. The marbles of Carrara were even then known but not generally put in use till later years, being still among the finest marble in the world, though having some gray streaks.

In many other parts of Continental Europe and in Great Britain are quarries of fairly pure marble. In America, however, will eventually be found the finest supply of this useful stone in the world. Each year new juttings of it are found in wild parts of the Rocky Mountains, some of them pure white, while others are limned with variegated colorings, rivaling a rainbow in brilliancy. Perhaps the finest example of these wonderful marbles of the Rockies is found in the new State Capitol building of Colorado, at Denver. The geologists of that State have been unusually energetic in discovering useful minerals in their mountains and have incorporated in the Capitol many of them. Walls, exterior and interior, are composed of richly grained granites and marbles, more beautiful and rare than any even dreamed of by the ancients. In the same slab of stone can often be seen a variegation of lines and hues, ranging from the purest white, with sparkling granular crystals of calcite, to delicate grays, limpid blues, vivid reds and velvety onyx. To reproduce this celebrated structure in any other part of the world would be a labor almost impossible of accomplishment and infinitely costly. In the eastern part of the United States there are many quarries of marble which have been in use for many years. Vermont is probably the seat of the largest quarries. Little of this marble is finely grained and white enough to answer for the sculptor's use, but it is admirably adapted for ornamental purposes in architecture and for monuments for the dead. American sculptors still generally use the marbles from Carrara, though the merits of the American product are becoming known. Vermont, although one of the smallest States in the Union, exports more stone for commercial purposes than any other State, except one, Pennsylvania standing first. The money value in 1903 of Vermont's stone product was in excess of $6,000,000, a large part of it being in marbles of various grades.

The quarrying of marble is now carried on extensively, the use of machinery largely taking the place of the ancient hand methods. Fifty years ago the quarries of Rutland, Vt., still the largest in the world, were operated by ox teams, and hand work of the crudest form. To-day, these vast quarries have an extensive outfit of electric cranes and derricks, which move the blocks of marble in any desired direction, easily and quickly, one of these traveling cranes having a carrying capacity for 100,000 pounds. The stone is too easily broken to permit the use of blasting powders of any kind. This method is used in some of the Italian quarries, but causes great waste of material and is most unsatisfactory. In the Vermont quarries, a machine called a "channeler" has been found the best for economical work, and has been exclusively adopted for about ten years. It consists of a row of long chisels set in a strong, traveling framework. This gang of chisels vibrate up and down, cutting a channel in any direction desired in the face of the marble ledge. The channel can be made any reasonable depth, according to the size of block desired. When this channel, or groove, is sufficiently long and deep, the machine is reversed and cross channels are cut and the bottom perforated. Then wedges are carefully driven in behind the block of stone and it gently falls over, to be lifted by a crane to the railroad cars or to that part of the quarry devoted to further treatment of the output. As a rule, the stone is sent in its rough state to the purchaser, who dresses it himself. When the order is for monument work or some special design in architecture, the marble is treated at or near the quarry. In thus further treating the product, a toothless saw, or gang of saws, is used. The block of stone is placed on a horse, or platform, and the saws set at work, the size of the cut being gauged by setting the saws close together, or far apart, as needed. A stream of water in which is mixed sea sand or other sharp, hard sand, falls upon each saw. The friction of the iron blade, aided by the sand and water, quickly cuts up the marble into any desired shape. Some marble cutters use saws of wire, but the best seem to be those made of strips of soft iron one sixteenth of an inch thick and, when new, four inches wide. The marble wears down one of the saw blades very rapidly. When the blocks are thus sawn into the requisite shapes by the power gang-saws, they are then placed on tables and ground down to size, a small piece of marble being rotated over them by hand or power, water flowing over the surface being ground. With surprising facility, the marble yields to this treatment. Polish, in the final stages, is given by rubbing with wood or other soft material, and finally cloth. Much hand work is, of course, necessary with the mallet and chisel and polisher; but all the rough, heavy work, which formerly made marble so costly and hard to obtain, is now done entirely by electric and steam power. One of the finishing rooms at the Rutland works, located at Proctor, Vt., is 1,000 feet long and contains scores of giant gang saws, cutting up the marble into various shapes. This one plant, the largest in the world, has an output of $3,000,000 annually, and employs hundreds of men. Most of this output is of white marble, though brown, gray, green and other shades are found in profusion.

One ancient method of mining this delicate stone, still used entirely by the Mexicans in mining onyx, is to drill holes in a line, insert plugs of some porous wood, pour in water and allow the wood to swell. This gently forces the precious stone free, without the least injury.

One quality of marble, not usually recalled, is its ability to withstand great heat safely. In the devastating fire in 1903 at Paterson, N. J., buildings built of granite crumbled and perished. Those of marble still stand, almost as good as ever. Its use is therefore becoming more and more general in erecting fireproof buildings in the large cities, the floors and often the entire inside wall and ceiling being overlaid with it.

Some really fine examples of craftsmanship in this line are found in the public buildings of New York city and elsewhere in America, notably the new buildings of the Hall of Records and the Appellate Division of the Supreme Court, in New York. In the making of monuments for the dead, marble is most extensively used. The floors of bathrooms, tops of toilet tables, basins for washing hands and clothes, tiling of various sorts — all these and a thousand other household purposes find in marble their chief exponent. Probably more than $25,000,000 worth of finished marble products are used in the United States annually, made from domestic quarries entirely.

Putnam Drew.

Marble Faun, The, a romance by Nathaniel Hawthorne published in 1860. This is the last complete work by the author, and was thought by him to be his best. It was composed carefully and maturely, Hawthorne not having written anything for seven years; and appeared simultaneously in Boston and London under different titles. The original name proposed was 'The Transformation of the Faun,' shortened by the English publisher into 'Transformation,' and changed in America by Hawthorne to 'The Marble Faun.' The scene is laid in Rome; the chief characters, four in number, are introduced in the first chapter: Kenyon, an American sculptor; Hilda and Miriam, art students; and Count Donatello, an Italian.

Marbled Godwit. See Godwit.

Marbled Tiger-cat. See Tiger-cat.

Mar'blehead, mär'bl-hĕd, Mass., town, in Essex County; on Massachusetts Bay, and on the Boston & Maine railroad. The town is on a peninsula which has Massachusetts Bay on the east and south and Salem harbor on the north, and includes the villages of Marblehead, Neek, Clifton, and Devereaux. It was settled by immigrants from Guernsey and Jersey in 1629, and was a part of Salem until 1649. Its good harbor gave it advantages for fishing and for coast trade that made it for a time the second settlement in importance in the colony, Boston being the first. Fishing continues one of the industries; others are boat-building and the manufacturing of shoes. It is a favorite yachting resort. There are still, in a good state of preservation, a number of pre-revolutionary buildings. The town has three well-kept parks, and Abbott Hall, which contains the town library, art gallery, and records. Pop. (1910) 7,338.

Judge Story and Elbridge Gerry were born and lived for some years in Marblehead. Consult: Agge, 'Sketches of Marblehead'; Roads, 'The History and Traditions of Marblehead.'

Mar'bles and Marble Playing. Marbles are small balls of baked clay, marble, agate or other minerals, used as toys and playthings for children. They are manufactured in large quantities in Saxony for exportation to the United States, and to India and China. They are also largely manufactured in the agate mills at Oberstein on the Nahe, in Germany, particularly for the American market. The material used in Saxony is a hard calcareous stone, which is first broken up into square blocks with a hammer. These are then thrown 100 to 150 together into a mill, which is constructed of a stationary flat slab of stone, with a number of concentric furrows upon its face. Over this a block of oak of the same diameter, partially resting upon the small stones, is kept revolving, while water flows upon the stone slab. In 15 minutes the marbles are worn completely round, and are fit for sale. An establishment with three mills will manufacture 60,000 marbles in a week. Agates are made into marbles at Oberstein by first chipping the pieces nearly round with a hammer, and then wearing them down upon the face of large grindstones. The game of marbles is variously played; usually with a circular ring marked on the ground, the player taking one marble between the thumb and forefinger and dexterously shooting at other marbles within the circle, striking them with sufficient force as to throw then outside of the limits of the ring.

Mar'bling, in bookbinding, a process of ornamenting the edges of books. After the edges of the book have been cut by the plough (see BOOKBINDING) the book is tied between two boards and taken to the trough, a vessel 2 inches deep, which is filled with clean gum water. Various colored pigments, ground in spirits of wine and mixed with a small quantity of ox gall, are thrown upon the surface of the gum water, and disposed in various forms with a quill and comb, according to the required pattern. This being obtained, the edges of the book are dipped into the trough, and the colors adhere. Cold water is then dashed over the edges, which sets the colors and brings them out clear.

Marburg, mär'boorg, Prussia, a town of Hesse-Nassau, on the slopes of an acclivity above the Lahn, 46 miles north of Frankfort, 60 miles by rail via Cassel. The principal buildings are the castle of the landgraves of Hesse, now partly used as a prison; the 13th century church of St. Elizabeth; the town-house and the celebrated university, the first founded in Germany after the Reformation, and having in 1900, 93 professors and 1,184 students. The town has manufactures of machinery, leather, pottery and toys. Pop. about 20,000.

Mar'bury v. Madison, a well-known decision in law handed down in 1803 by the United States Supreme Court. It is important as affording the earliest instance of the declaration by the Court that a Congressional statute is null and void by reason of its repugnance to the Constitution of the United States. Marbury was appointed justice of the peace in the District of Columbia by President Adams, but the commission, though drawn up, signed, and sealed, had never been delivered. Madison, when he became secretary of state, refused to deliver it. An act of Congress empowered the United States Supreme Court to issue to executive officers a writ of mandamus to force them to attend to their duties, and on the basis of this act Marbury brought suit. Now the Constitution nowhere mentions the right to issue a writ of mandamus among the cases of original jurisdiction by the Supreme Court. Chief-Justice Marshall therefore decided against Marbury, and his argument, admittedly the only accurate one, established an important precedent which is found only in the courts of the United States.

Mar'casite, in mineralogy, a bisulphide of iron. The term includes several varieties of iron pyrites, which have been named after the form they present: namely, cellular pyrites, cockscomb pyrites, hepatic pyrites, or leberkies, etc. It is used in the manufacture of sulphur, sulphuric acid, and sulphate of iron.

Marcel, Etienne, ā-tē-ĕn mär-sĕl, French political leader: d. Paris 31 July 1358. From December 1355 he was provost of the Paris merchants and actual ruler of the city. He put to death two officials of the crown, and finally persuaded the Dauphin Charles to act as regent while King John was held by the English. Not finding the Dauphin properly submissive, he obtained assistance from Charles the Bad of Navarre. He was killed during an uprising of the more wealthy and conservative citizens against his power. Consult Lazard, 'Un Bourgeois de Paris au XIV. Siècle' (1890).

Marcellinus, mär-sĕ-lī'nŭs, **Saint:** d. 25 Oct. 305. He was a pope who succeeded Caius in 296. The Donatists alleged that during the Diocletian persecution he sacrificed to idols. He was, however, vindicated by Augustine from this charge.

Marcellus, mär-sĕl'ŭs, **Marcus Claudius,** Roman general: b. before 268 B.C.; d. near Venusia, 208 B.C. In 222 being consul with Scipio he twice defeated the Insubrians in northern Italy, and with his own hand killed their king, thus winning the *spolia opima.* After the disaster of Cannæ in the Second Punic War (216), Marcellus took command, gained several slight victories over the Carthaginians, and hence was named "the sword of Rome," Fabius Cunctator being called "the shield of Rome." His third consulship (214) was spent in Sicily, where he attacked Syracuse, and after a two years' siege prolonged by the skill of Archimedes captured the city. In his fifth consulate after two years of varying success against Hannibal in Italy he was killed in a skirmish near Venusia.

Marcellus I., Saint, pope: d. 310. He succeeded Marcellinus in 304. The Emperor Maxentius banished him from Rome for excommunicating an apostate, and according to some authorities forced him to serve as a slave in the imperial stables. He suffered martyrdom under Maxentius.

Marcellus II. (MARCELLO CERVINI, mär-chĕl'lo chĕr-vē'nē), pope: d. 1 May 1555. He was cardinal legate at Trent of Julius III., whom he succeeded in the pontifical chair. Although originally opposed to polyphonic music, he at once withdrew his opposition to it after listening to Palestrina's famous 'Missa Papæ Marcelli.' His pontificate lasted only 22 days.

Marcellus Stage, in geology, a term introduced by the New York State Geological Survey for the thin rock mostly shale, which is the lowest group of the Upper Devonian System, and which is most typically seen in New York State at the little village of Marcellus, whence the stage is named.

March, Francis Andrew, American philologist: b. Millbury, Mass., 25 Oct. 1825. He was graduated from Amherst in 1845, studied law in New York in 1849–50, was admitted to the bar in 1850, in 1856 became adjunct professor of belles-lettres and English literature in Lafayette College (Easton, Pa.), and in 1857 professor there of the English language and comparative philology. In 1873–4 and 1895–6 he was president of the American Philological Association, in 1876–1903 of the Spelling Reform Association and in 1891–3 of the Modern Language Association. He was among the earliest advocates of a historical study of the English language, and of a philological study of the classic works of that language. His contributions to the transactions and proceedings of the American Philological Association and other learned societies have been very extensive. He also edited the Douglass series of Christian Greek and Latin classics (1874–6), was director of the American readers for the great 'Historical Dictionary of English' of the London Philological Society, and published: 'A Method of Philological Study of the English Language' (1865); 'Parser and Analyzer for Beginners' (1869); an 'Anglo-Saxon Grammar' (1870); an 'Anglo-Saxon Reader' (1870); and an 'Introduction to Anglo-Saxon' (1871).

March, märh, Austria-Hungary, the principal river of Moravia, rising on the Silesian boundary, and flowing 214 miles southward to the Danube, which it joins six miles above Presburg. It is navigable for small boats from Göding, 50 miles from its mouth. In its lower course it forms the boundary between Austria and Hungary. Its chief affluent is the Thaya.

March, in Europe, a frontier or boundary of a territory; especially applied to the boundaries or confines of political divisions; as, for example, the frontiers between England and Scotland, and England and Wales. Geneva is situated in the Marches of France, Savoy and Switzerland.

March (Latin, *Martius*), (1) the third month of the year, originally the first of the Roman year; so named in honor of the Roman deity Mars. Prior to 1752 the 25th of March was the first day of the legal year; hence, January, February, and the first 24 days of March have frequently two years appended, as January 1, 1701/2 or 1701–2. (See CALENDAR.) (2) A movement by regular steps in the manner of soldiers; also a journey performed by a body of soldiers either on foot or on horseback. Soldiers on a march are subject to certain rules very necessary to keep them in good order, and fit to meet the enemy. The march in the first sense of regular step differs on different occasions. In the parade-march from 75 to 95 steps, each of about 30 inches, differing in different armies, are made in a minute; in the quick-march from 108 to 115 steps; and in the double quick 150 running paces. This last cannot be sustained for any length of time, and is only used in a charge, or in storming a commanding position, and in a few internal movements of regiments. (3) A musical composition, chiefly for military bands, with wind instruments, intended to accompany the marching of troops. There are slow and quick marches, and marches peculiar to different countries. Marches are also introduced into oratorios, the best-known examples being the 'Dead March' from the oratorio of 'Saul' and Mendelssohn's 'Wedding March.' See MUSIC.

March Flies, small, hairy, scavenging flies of the family *Bibionidæ*, seen numerously in early spring, often before the snow has disappeared. The species are over 300, and some appear in vast swarms. The maggots hatch in refuse or manure upon the ground, and are believed to feed upon grass-roots.

March to the Sea. There were two plans for a march to the sea by Sherman's army, the first Gen. Grant's, the second Gen. Sherman's, modifying the first. A campaign to the sea to divide the Confederacy was decided upon by Gen. Grant in January 1864, when he was in command of the Military Division of the Mississippi, with headquarters at Nashville. His objectives on the coast were first Mobile, second, Savannah, Atlanta being the intermediate objective for both. Sherman's army was then in the vicinity of Chattanooga, Tenn., and Ringgold, Ga.

In a letter to Gen. Halleck, dated at Nashville, 15 Jan. 1864, Gen. Grant wrote: «I look upon the next line for me to secure, to be that from Chattanooga to Mobile, Montgomery and Atlanta being the important intermediate points.» This he repeated on 19 January to Gen. Thomas, then in command of the Army of the Cumberland at Chattanooga, and this officer immediately began to gather information, which Gen. Grant desired, of the number of troops necessary to guard the roads and bridges from Nashville to Atlanta. These preparations were entrusted to Gen. Thomas, as Gen. Sherman was engaged with his Meridian campaign. In this connection, Gen. Thomas expressed his confidence in being able with the Fourteenth and Fourth corps in advance, covered with a strong division of cavalry, and the Eleventh corps in reserve, to overcome all opposition as far as Atlanta.

When Grant was made lieutenant-general and ordered east to command all the armies, he called Sherman to Nashville, and they traveled together as far as Cincinnati. Gen. Sherman was then made acquainted with the plans already set forth. As part of these plans, before leaving Nashville Gen. Grant ordered Banks to concentrate at least 25,000 men to move against Mobile in the spring in co-operation with Gen. Sherman.

In addition to letters to each of the commanders interested — Halleck, Sherman, Thomas and Banks — Gen. Grant, 26 March 1864, sent all army commanders a map upon which was indicated by red lines the territory occupied by the Union forces at the beginning of the War, and at the opening of the campaign of 1864. The territory which it was proposed to occupy by the campaigns about to begin was indicated by blue lines. This map reached Gen. Sherman 4 April, and its receipt was acknowledged by him. This map is reproduced in the Atlas of the 'Official Records' of the war, being plate 135 A of that publication. For Sherman's proposed campaign the blue lines extend from Chattanooga to Atlanta, and from this latter point both to Mobile and Savannah.

Gen. Sherman, in acknowledging the map, said: «That map to me contains more information and ideas than a volume of printed matter. Keep your retained copies with infinite care, and if you have occasion to send out to other commanders any more I would advise a special courier. From that map I see *all*, and glad am I that there are minds now at Washington able to devise; and for my part, if we can keep our counsels, I believe I have the men and ability to march square up to the position assigned me, and to hold it.»

As the result of the campaign for Atlanta Gen. Slocum occupied that city 2 September. Meantime Farragut had taken possession of Mobile Bay 5 August. On 10 September Grant telegraphed Sherman from City Point as follows: "As soon as your men are properly rested, and preparations can be made, it is desirable that another campaign should be commenced. We want to keep the enemy continually pressed to the end of the war. If we give him no peace while the war lasts, the end can not be far distant. Now that we have all of Mobile Bay that is valuable, I do not know, but it will be the best move for Major-General Canby's troops to act upon Savannah, while you move on Augusta. I should like to hear from you, however, on this matter."

To this Sherman telegraphed in reply: "If you can manage to take the Savannah River as high as Augusta, or the Chattahoochee as far up as Columbus, I can sweep the whole State of Georgia, otherwise I would risk our whole army by going too far from Atlanta."

In a letter from Atlanta, dated 20 September, Sherman gave Grant the conditions under which he could successfully co-operate in a movement on Savannah: "If you will secure Wilmington and the city of Savannah from your centre, and let General Canby have command over the Mississippi River and the country west of it, I will send a force to the Alabama and Appalachicola, provided you give me 100,000 of the drafted men to fill up my old regiments; and if you will fix a day to be in Savannah I will insure our possession of Macon and a point on the river below Augusta."

Gen. Grant thereupon conferred by letter with Gen. Halleck in regard to establishing a base on the coast for Gen. Sherman and providing supplies, giving his own opinion that Savannah could be captured by troops from the east assisted by those in the Department of the South, and that the line of Augusta and Savannah would be a better one than Montgomery, Selma, and Mobile. Grant further said in this letter 4 October: "Whichever way Sherman moves he will undoubtedly encounter Hood's army, and in crossing to the sea-coast will sever the connection between Lee's army and his section of the country."

Gen. Sherman fixes the day after his letter of 20 September as the date when his plan of a march to the sea came first into his mind. It differed from Grant's plan based upon first disposing of Hood's army, in that it involved leaving Hood in his rear, to be taken care of by Thomas, and marching through to Savannah with no enemy in his front. Upon this plan a discussion arose with Grant, who for some time held to the necessity of first dealing with Hood. This discussion between Grant and Sherman lasted for several weeks. While it was in progress Hood became active. On 20 September Forrest's cavalry began vigorous operations about Athens and Decatur, Ala., and Pulaski, Tenn. Sherman at once sent troops to Chattanooga, and 28 September Gen. Thomas was ordered to proceed to Nashville to organize a force to meet a possible northward move of Hood. The first attempt of the latter was to break Sherman's communications by heavy movements upon his railroad. These met with only temporary success, as Sherman promptly pursued. The fighting at Allatoona 5 October was the most prominent affair. Hood then moved to the westward, and occupied Gadsden, Ala. Sherman again followed as far as Gaylesville. Sherman, 10 October, again proposed to Grant to leave Hood and march to the sea. Grant replied the same day. "If you are satisfied the trip to the sea-coast can be made, holding the line of the Tennessee firmly, you may make it, destroying all the railroads south of Dalton or Chattanooga as you think best." This condition of firmly holding the line of the Tennessee held Sherman for a time. Although this conditional permission had been given by Grant, he telegraphed Sherman 1 Nov.: "Do you not think it advisable, now that Hood has gone so far north, to entirely settle with him before starting on your proposed campaign? With Hood's army destroyed you can go where you please with impunity." Sherman learned, 26 October, that Hood's army had appeared about Decatur. This clearly indicated an invasion of Tennessee. Gen. Sherman then decided to strengthen Gen. Thomas, leave him to take care of Hood, withdraw his own army to Atlanta, and prepare for a march to the sea provided Gen. Grant's consent could finally be obtained. He sent the Fourth and the Twenty-third corps back to Thomas. Thus the discussion with Grant over the question of first destroying Hood continued until 1 November, when, in response to a later telegram on that day from Sherman, which represented that Hood's whole force was only from 37,000 to 40,000, while Thomas would have from 63,000 to 70,000, and that he himself had retained only 50,000 men for his proposed campaign to the coast, Gen. Grant telegraphed, "With the force, however, that you have left with Gen. Thomas, he must be able to take care of Hood and destroy him. I really do not see that you can withdraw from where you are, without giving up all that we have gained in territory. I say then go on as you propose."

Having obtained this permission Sherman pushed his preparations with the greatest energy. The entire population of Atlanta had already been deported; the various divisions of the army designed for the march were ordered to concentrate at Atlanta; all mills and factories at Rome were burned; the surplus stores, the sick, convalescent, and many thousands whose terms of service were about to expire were rushed to Chattanooga; the garrisons south of that place were withdrawn, and the railroad destroyed. Every command was carefully inspected, and soldiers found in any degree physically unsound were despatched to Nashville. Care was taken that every man's accoutrements were complete. In the same way the horses, mules, and trains were inspected. Wilson's cavalry was dismounted to make Kilpatrick's division perfect, and the remnants sent with Wilson to Nashville.

The march to the sea began on the morning of 15 November. As Gen. Sherman wrote: "It surely was a strange event — two armies marching in opposite directions, each in the full belief that it was achieving a final and conclusive result in a great war;—" Hood's army, which had required the active work of three armies from May until September to push it back to Atlanta, had crossed the Tennessee at Decatur, strengthened by Forrest's cavalry and aiming for Nashville and the Ohio River. The situation at Nashville was thus described by Sherman: "General Thomas was at Nashville, with Wilson's dismounted cavalry and a mass of new troops and quartermaster's employees amply sufficient to defend the place. The Fourth and Twenty-third corps, under Generals Stanley and Schofield, were posted at Pulaski, Tennessee, and the cavalry of Hatch, Croxton, and Capron, were about Florence, watching Hood. Smith's (A. J.) two divisions of the Sixteenth corps were still in Missouri, but were reported as ready to embark at Lexington for the Cumberland River and Nashville. Of course, General Thomas saw that on him would likely fall the real blow, and was naturally anxious.»

Sherman started with 62,204 officers and men. Of his army he wrote: «The most extraordinary efforts had been made to purge this army of non-combatants and of sick men, for we knew well that there was to be no place of safety save with the army itself; our wagons were loaded with ammunition, provisions, and forage, and we could ill afford to haul even sick men in the ambulances, so that all on this exhibit may be assumed to have been able-bodied, experienced soldiers, well armed, well equipped and provided, as far as human foresight could, with all the essentials of life, strength, and vigorous action.»

The artillery, wagon, and ambulance trains were perfect. Each gun, caisson, and forge was drawn by eight horses. There were 2,500 wagons with six mules to each, and the ambulances each had two horses. Each soldier carried 40 rounds, and in the ammunition wagons were 200 rounds for men and artillery.

The right wing, Gen. O. O. Howard, was composed of the Fifteenth and Seventeenth corps; the left wing, Gen. H. W. Slocum, of the Fourteenth and the Twentieth.

The war had not produced a more thoroughly organized and equipped army, or one in which more men had passed a thorough physical inspection. As it started for the sea, Gen. Sherman in his 'Memoirs' thus describes the feelings of the men, and his own: «There was a devil-may-care feeling pervading officers and men, that made me feel the full load of responsibility, for success would be accepted as a matter of course, whereas, should we fail, this 'march' would be adjudged the wild adventure of a crazy fool.» This question was to be decided at Nashville, as Gen. Sherman wrote the day after he entered Savannah: «Thomas' complete success is necessary to vindicate my plans for this campaign—» The march to the sea cannot, therefore, be fully understood without considering the Nashville campaign as one of its essential parts. See NASHVILLE, CAMPAIGN AND BATTLE OF.

Sherman's army was composed of 55,329 infantry, 5,063 cavalry, and 1,812 artillery. There were two corps, 13 infantry divisions, one cavalry division, 36 brigades of infantry, two of cavalry, and 16 batteries. There was no Confederate army between Atlanta and Savannah. Wheeler's cavalry was active on the flanks guarded by Kilpatrick's cavalry, and a considerable force of militia was encountered at Griswoldville.

The order for this historic march clearly presents its organization, its order of daily movement, its methods of living upon the country, the restrictions placed on its dealings with citizens, in short, the whole military machinery of the campaign. It therefore deserves a place in every history of the March to the Sea, Gen. Sherman himself holding that no account of that event could be perfect without it. It was as follows:

(Special Field Orders, No. 120.)

Headquarters Military Division of the Mississippi, In the Field, Kingston, Georgia, November 9, 1864.

1. For the purpose of military operations, this army is divided into two wings, viz.:

The right wing, Major-General O. O. Howard commanding, composed of the Fifteenth and Seventeenth corps; the left wing, Major-General H. W. Slocum commanding, composed of the Fourteenth and Twentieth corps.

2. The habitual order of march will be, wherever practicable, by four roads, as nearly parallel as possible, and converging at points hereafter to be indicated in orders. The cavalry, Brigadier-General Kilpatrick commanding, will receive special orders from the commander-in-chief.

3. There will be no general train of supplies, but each corps will have its ammunition-train and provision-train, distributed habitually as follows: Behind each regiment should follow one wagon and one ambulance; behind each brigade should follow a due proportion of ammunition-wagons, provision-wagons, and ambulances. In case of danger, each corps commander should change this order of march, by having his advance and rear brigades unencumbered by wheels. The separate columns will start habitually at 7 A.M., and make about fifteen miles per day, unless otherwise fixed in orders.

4. The army will forage liberally on the country during the march. To this end, each brigade commander will organize a good and sufficient foraging party, under the command of one or more discreet officers, who will gather, near the route traveled, corn or forage of any kind, meat of any kind, vegetables, corn-meal, or whatever is needed by the command, aiming at all times to keep in the wagons at least ten days' provisions for his command, and three days' forage. Soldiers must not enter the dwellings of the inhabitants, or commit any trespass; but, during a halt or camp, they may be permitted to gather turnips, potatoes, and other vegetables, and to drive in stock in sight of their camp. To regular foraging-parties must be entrusted the gathering of provisions and forage, at any distance from the road traveled.

5. To corps commanders alone is entrusted the power to destroy mills, houses, cotton-gins, etc.; and for them this general principle is laid down: In districts and neighborhoods where the army is unmolested, no destruction of such property should be permitted; but should guerillas or bushwhackers molest our march, or should the inhabitants burn bridges, obstruct roads, or otherwise manifest local hostility, then army commanders should order and enforce a devastation more or less relentless, according to the measure of such hostility.

6. As for horses, mules, wagons, etc., belonging to the inhabitants, the cavalry and artillery may appropriate freely and without limit; discriminating, however, between the rich, who are usually hostile, and the poor and industrious, usually neutral or friendly. Foraging parties may also take mules or horses, to replace the jaded animals of their trains, or to serve as pack-mules for the regiments or brigades. In all foraging of whatever kind, the parties engaged will refrain from abusive or

threatening language, and may, where the officer in command thinks proper, give written certificates of the facts, but no receipts; and they will endeavor to leave with each family a reasonable portion for their maintenance.

7. Negroes who are able-bodied and can be of service to the several columns may be taken along; but each army commander will bear in mind that the question of supplies is a very important one, and that his first duty is to see to those who bear arms.

8. The organization, at once, of a good pioneer battalion for each army corps, composed if possible of negroes, should be attended to. This battalion should follow the advance-guard, repair roads and double them if possible, so that the columns will not be delayed after reaching bad places. Also, army commanders should practise the habit of giving the artillery and wagons the road, marching their troops on one side, and instruct their troops to assist wagons at steep hills or bad crossings of streams.

9. Captain O. M. Poe, chief-engineer, will assign to each wing of the army a pontoon-train, fully equipped and organized; and the commanders thereof will see to their being properly protected at all times.

By order of Major-General W. T. Sherman,
L. M. Dayton, Aide-de-Camp.

Leaving Atlanta in ruins, 15 November, the left wing, which Gen. Sherman accompanied, marched by Decatur, Stone Mountain, and Covington. At this point it turned toward Milledgeville, the capital of Georgia, which was the first objective. It was reached on the 22d. Meantime the right wing had marched by Jonesboro, McDonough, and Monticello, and was in communication with Sherman at Gordon. Kilpatrick's cavalry, which was operating on the right of the advance, kept in contact with Wheeler's cavalry, and reached the defenses of Macon, thence retiring to Griswoldville, where Walcutt's brigade of Wood's division was halted as a rear-guard. Gen. G. W. Smith attacked Walcutt, but was repulsed (see Griswoldville, Battle of). Gov. Brown, the State officers, and members of the legislature left the capital on Sherman's approach. The arsenal and various public buildings were destroyed.

The march was resumed 24 November, with Millen as the next objective. The two wings followed the general line of the railroad. Millen was reached 3 December. From Millen the army proceeded by the four main roads for Savannah. The effort of the Confederate authorities to organize a force at Augusta to attack Sherman in flank failed, and the march to Savannah was only slightly disturbed by the persistent skirmishing of Wheeler's cavalry. McLaw's division of Hardee's force had advanced to Ogeechee Church, but fell back to the city upon Sherman's approach. The several corps reached the defenses of Savannah 9 and 10 December, and occupied a line from the Ogeechee River on the right to the Savannah River on the left. Hardee occupied the city with something less than 10,000 men. Sherman's effective force numbered a little over 60,000. Hood held the Savannah River below Sherman's lines.

The march had cut a swath of many miles in width through the richest part of Georgia. The heads of the columns and the flanks swarmed with foraging parties, and a country which was daily scoured to supply food for a marching column of 60,000 soldiers was of necessity stripped of provisions, and of everything else that could contribute to the use or comfort of an army. Railroads had been destroyed for long distances, and all factories and other buildings burned which could contribute to army purposes. There had been no fighting worth mentioning, Griswoldville excepted, and that had only involved one Union brigade.

Gen. Sherman had left Atlanta with 62,204 officers and men of all arms. He reached Savannah with 60,057. On the march 103 were killed, 428 wounded, 278 missing, and 1,338 captured. Of those captured, a large proportion were foragers, better known in army vernacular as "bummers."

The night of 12 December a bridge had been completed over the Ogeechee, and the next morning Hazen's division crossed and marched at once to assault Fort McAllister (q.v.) and open the way to the sea. An hour before sunset the assault was delivered and the fort taken. This success gave Sherman communication with the fleet which was awaiting him with supplies, and mails for the army.

Gen. Slocum, upon establishing his flank on the Savannah River, had captured two steamboats and sent a force to Hutchinson and Argyle Islands just above the city, and sought permission to transfer a corps to the left bank of the river to close Hardee's only line of escape, Gen. Slocum having already sent a brigade under Col. E. A. Carman to the South Carolina shore. Gen. Sherman did not deem this prudent, and as a result Hardee later withdrew his entire force intact and without molestation.

On 17 December Gen. Sherman sent in a flag of truce demanding Hardee's surrender on the ground that he (Sherman) had received guns that could "cast heavy and destructive shot as far as the heart of the city"; that he controlled all avenues by which the city could be supplied with food; that he would grant liberal terms, but if forced to assault he should "feel justified in resorting to the harshest measures," and should make little effort to restrain his army.

Gen. Hardee returned a defiant reply, saying he was not shut in, but had free and constant communication with his department. To the specific call for surrender he replied: "Your demand for the surrender of Savannah and its dependent forts is refused."

Gen. Sherman then proceeded by boat to Gen. Foster's headquarters at Hilton Head to request that a division be sent to occupy the road north of the Savannah River, which line of communication was still open to Hardee. On his return he received the news that during his absence Hardee had put down his bridges and withdrawn with his entire force. The next day Gen. Sherman's forces occupied Savannah.

Bibliography.—'Memoirs Gen. W. T. Sherman,' Vol. II.; 'Personal Memoirs Gen. U. S. Grant,' Vol. II. Official Records War of the Rebellion, Vols. XXXII., parts 2 and 3; XXXIX., parts 2 and 3; and XLIV. H. V. Boynton.

Marchand, mär-shäñ, Félix Gabriel, Canadian legislator and author: b. St. John's, P. Q., 9 Jan. 1832. He was educated at St. Hyacinth College, was admitted a notary public in 1855, entered practice at St. John's, and from 1867 sat for the county of St. John's in the legislative assembly of the province of Quebec. From 8 March 1878 to 19 March 1879 he was provincial secretary, from 19 March to 30 Oct 1879 was commissioner of crown-lands, and from 29 Jan. 1887 to 1892 speaker of the assembly. In 1897 he became premier, with the treasury portfolio. Subsequent to the invasion at Eccles Hill during the Fenian troubles (1870), he commanded a militia brigade. He did much to improve Canadian journalism, and for many years was proprietor and editor of *Le Franco-Canadien*. He published a 'Manuel et Formulaire du Notariat'; and also the comedies 'Fatenville' and 'Erreur n'est pas Compte' in prose, and 'Un Bonheur en Attire un Autre' and 'Les Faux Brillants' in verse.

Marchand, Jean Baptiste Thomas, zhŏṅ bä-tēst tō-mä, French officer and explorer: b. Thoissey 22 Nov. 1863. He attended the military school at St. Maixent, entered the marine service in 1883, was sent to Senegambia in 1889, and in 1890 explored the sources of the Niger. In 1898 he occupied Fashoda, having established a line of posts between French possessions in West Africa and on the eastern coast, but on the demand of England he was forced to withdraw. He took part in the expedition against China in 1900. Consult: Castellani, 'M. l'Africain' (1902); Poirier, 'De l'Oubanghi à Fachoda' (1900).

Marches, The, Italy, a territory now included in the kingdom, but formerly constituting one of the legations of the Papal States. It comprises the region lying between the Apennines and the Adriatic, and is divided into the modern four provinces — Urbino and Pesaro, Ancona, Macerata, and Ascoli Piceno. See Italy.

Marchesi, mär-kā'sē, **Mathilde,** German singer: b. Frankfort-on-Main, 26 March 1826. Her maiden name was Graumann; she studied under Nicolai in Vienna, and in Paris under Garcia, whose assistant she became. A splendid mezzo soprano she toured Europe for several years, married Salvatore Marchesi, a baritone, in 1852, and in 1854 became professor at the Vienna Conservatory. After three years at Cologne in a like position she removed to Paris in 1868. She was a teacher of rare merit, and author of a method of singing, of two volumes of personal recollections in German (1877; 1888), and of 'Marchesi and Music' (1897).

Marchiali, mär-kē-ä'lē, or **Marchialy.** See Iron Mask, Man with the.

Marching Through Georgia, a popular ballad sung during the American Civil War, and commemorating Sherman's March to the Sea. It was written by H. C. Work (q.v.) 16 Nov. 1864.

Marcion, mär'shĭ-ŏn, founder of a Gnostic sect, called Marcionites: b. Sinope about the beginning of the 2d century, A.D.; d. about 160. He was a son of the bishop of Sinope, who had become a bishop in his later years, but so much error was mixed with his religious opinions that he was excommunicated by his father. Expecting that his views would meet with a better reception at Rome he set out for that city, but was there a second time excommunicated, 140. He attached himself while there to the Gnostic teacher Cerdo of Antioch, and founded a system antagonistic in many respects to Christianity. Its principal feature was the irreconcilable opposition which it supposed to exist between the Creator and the Christian God, and between the religious systems, the law and the gospel, which it believed they respectively founded. The sect held the existence of three original principles — the supreme and invisible, whom Marcion called the Good; the visible God, the Creator; and the devil, or perhaps matter, the source of evil. Marcion could not perceive in nature, or in the Old Testament, the same love which was in the gospel of Christ. He accordingly made the Creator, the God of the Old Testament, the author of suffering. Jesus was not the Messiah promised by this being, but the son of the unseen God, who took the form, but not the substance of man. Marcion denied the resurrection of the body; he condemned marriage, thinking it wrong to increase a race born in subjection to the harsh rule of the Creator. He rejected the whole of the Old Testament, and of the New all except a few epistles and a mutilation of the Gospel of Luke. Consult: Tertullian, 'Contra Marcionem'; Harnack, 'History of Dogma.'

Marco Bozzaris. See Bozzaris, Marcos.

Marco Polo. See Polo, Marco.

Marcomanni, mär-kō-măn'nĭ ("men of the marches," "borderers"), ancient German tribe, belonging to the confederation of the Suevi. About 10 B.C., under their King Marbod or Maroboduus, they retired from their territory between the Elbe and the Oder before the advance of the Romans, settled in Bohemia, and there built up a powerful state, with which Tiberius made a treaty 6 A.D. Thirteen years later Maroboduus was defeated by Hermann, or Arminius, leader of the Cherusci, who also drove from power Catualda, Marbod's successor. About the middle of the 2d century the Marcomanni, with other Teutonic tribes, attempted to make inroads into Pannonia; they were defeated by Marcus Aurelius in 178; Commodus made peace with them in 180; they furnished Roman troops and were heavily subsidized till the time of Aurelian, when in 270 they were again rebellious and again driven across the Danube. In the 4th century the Marcomanni drop out of history.

Marconi, Guglielmo, gool-ē-ĕl'mō mär-kō'nē, Italian inventor and electrical engineer: b. Marzabotto, near Bologna, Italy, 23 Sept. 1875. He was educated at the universities of Bologna and Padua, and so early as 1890 undertook experiments in demonstration of his theory that the electric current readily passes through any substance, and when started in a given direction follows a direct course without the assistance of any sort of conductor. He finally invented an apparatus for wireless telegraphy, which was successfully tested in England and Italy by Sir William Henry Preece, engineer and electrician-in-chief of the English postal-telegraph service. Marconi was the first to perfect the appliances used in space telegraphy, and the first to patent the application of the electric waves discovered by Heinrich Hertz to the purposes of actual telegraphy as distinguished from mere signaling. This remains true in spite of all the discussion respecting the originality of Marconi's work. It was he who combined the important elements of the wireless telegraph that had previously been invented, and to him the scientific triumph of space telegraphy is due. He came to the United States in 1899, there continued his experiments, and in 1900 employed his method in reporting the presidential election of that year. He had already (27 March 1899) sent messages across the English Channel from the vicinity of Boulogne, France, to the South Foreland, England, 32 miles distant. In December 1901 he began his first experiments in transatlantic telegraphy without wires at Signal Hill, at the entrance to the harbor of St. John's, N. F. When his success became apparent through his receiving and plainly distinguishing signals from the Poldhu Station, England, the Anglo-American Cable Company, which holds a monopoly from Newfoundland, compelled him to withdraw, and he selected another station at Table Head, on the east of Glace Bay, Cape Breton Island. On 25–6 Feb. 1902, Marconi, on his way to the United States on board the steamship Philadelphia, received signals at a distance of 2,099 miles and worded messages at a distance of 1,551.5 miles. On 21 Dec. 1902 the first official transatlantic telegrams were sent from Table Head. Marconi later (18 Jan. 1903) sent from the South Wellfleet station, Cape Cod, Mass., direct to Poldhu (3,000 miles), a message from President Roosevelt to King Edward. The Italian government introduced the Marconi system on its warships, and granted an annual subsidy of $200,000. The English government pays royalty for the use of the system on its ships. On 18 Oct. 1007 the Marconi system between Nova Scotia and Ireland was formally opened for commercial service. See Wireless Telegraphy.

Marcou, mär-koo′, **Jules**, American geologist: b. Salins, France, 20 April 1824; d. Cambridge, Mass., 17 April 1898. He studied at Besançon and the Collége de St. Louis in Paris; devoted himself to geology after several journeys through Switzerland, in which he made the acquaintance of Jules Thurmann, to whom he owed an introduction to Louis Agassiz. In 1846, after taking part in the geological survey of the Jura Mountains he was appointed assistant mineralogist in the Sorbonne; in 1848 having been appointed traveling geologist to the Jardin des Plantes came to America, explored the Lake Superior country together with Agassiz and made wide and important geological studies in Virginia, Pennsylvania and New Jersey, and after several trips back to Europe settled in Cambridge, where he assisted Agassiz in the Museum of Comparative Zoology. From 1853 to 1855 he was in government employ, and from 1875 till shortly before his death was again in the service. Marcou made a section map of the 35th parallel from the Mississippi to the Pacific, and published: 'Geological Map of the United States and British Provinces of North America' (1853); 'A Catalogue of Geological Maps of America' (1884); 'Geology of North America' (1858); 'Life, Letters, and Works of Louis Agassiz' (1896).

Marcus Aurelius, mär′kŭs â-rē′lĭ-ŭs. See Aurelius Antoninus, Marcus.

Marcus Græcus, grē′kŭs, pyrotechnist and alchemist, with regard to whose life nothing is known. He must have lived not later than the 11th century, since he is cited by an Arabian physician of that date. In the National Library at Paris are two manuscript copies of a small treatise, entitled 'Liber Ignium ad Comburendos Hostes, Auctore Marco Græco,' one of which appears to belong to the 14th and the other to the 15th century. The work contains an account of an explosive substance the ingredients of which are the same as those used in making gunpowder, though differently proportioned. It may have been that Schwartz, the reputed inventor of gunpowder, did nothing more than experiment on the receipts of Marcus Græcus. The treatise also contains the first account that has come down to us of the method of making Greek fire.

Mar′cy, Randolph Barnes, American general: b. Greenwich, Mass., 9 April 1812; d. Orange 22 Nov. 1887. He was educated at West Point in 1832; and served in the Black Hawk War. During the Mexican War he was active at Palo Alto and Resaca de la Palma; and was made inspector-general, U. S. A., with the rank of colonel, in August 1861, serving as chief of staff to his son-in-law, General George B. McClellan throughout the Civil War. He was appointed brigadier-general of volunteers, 23 Sept. 1861, was inspector-general, U. S. A., with rank of brigadier-general from December 1878. He was retired in the year last named. He published: 'Exploration of the Red River in 1852' (1853); 'The Prairie Traveler, a Handbook for Overland Emigrants' (1859); 'Thirty Years of Army Life on the Border' (1866); 'Border Reminiscences' (1871).

Marcy, William Learned, American statesman: b. Southbridge, Mass., 12 Dec. 1786; d. Ballston Spa, N. Y., 4 July 1857. He studied at Leicester Academy, in Massachusetts, and was graduated at Brown University in 1808. At Troy, N. Y., he studied law and was admitted to the bar. When the War of 1812 broke out he volunteered as a lieutenant, was sent at once into active service, and 22 Oct. 1812 led an attack resulting in the capture of a Canadian post at Saint Regis. He was soon promoted to be captain, and served almost to the end of the war. Returning to Troy, he engaged in newspaper work and in politics, opposed Clinton and became prominent in the Albany Regency (q.v.). He had already held several offices when, in 1823, he was elected comptroller of the State. This position he filled six years, and in 1829 was appointed associate justice of the New York supreme court. The Democrats in 1831 elected him to the United States Senate, but the next year he was chosen governor of New York and resigned his senatorship. While in the Senate he was chairman of the Judiciary Committee, and in debate with Clay made a memorable defense of Martin Van Buren. It was during a speech in the Senate vindicating the course of the President in giving offices to his political supporters that Marcy uttered the words associated with the beginning of the spoils system (q.v.): "We can see nothing wrong in the maxim that to the victors belong the spoils." Having served three terms as governor, he was once more nominated, in 1838, but was defeated by W. H. Seward (q.v.). In the following year Marcy was appointed by President Van Buren a commissioner on Mexican claims, serving till 1842. In 1845 he became secretary of war under Polk, and in that office bore arduous

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GUGLIELMO MARCONI

responsiblities created by the Mexican War. He also used his official influence in the settlement of the momentous Oregon boundary question. In 1848 he supported Cass as presidential candidate, and when Taylor was inaugurated Marcy retired to private life. But during the administration of Pierce he served from 1853 to 1857 as secretary of state, greatly distinguishing himself at home and abroad by his handling of grave matters,— the Mexican boundary dispute, the reciprocity treaty with Canada, the British fishery question, the Koszta affair (see INGRAHAM, DUNCAN NATHANIEL), etc. On the inauguration of President Buchanan in 1857 Marcy finally retired from office, dying four months afterward. Among statesmen of administrative ability and thorough training, both for domestic and foreign affairs, he holds a high and permanent place.

Marcy, Mount, N. Y., the highest peak of the Adirondack Mountains, in the northeastern part of the State, in Essex County; about 28 miles west of Lake Champlain. The altitude is 5,344 feet. Lake Tear of the Clouds, 4,327 feet above sea-level, usually considered the main source of the Hudson River, is just southwest of Mount Marcy. The Indian name for this peak was «Tahawas,» meaning the «cloud-divider.»

Mar′den, Orison Swett, American editor and author: b. Thornton, N. H. He was graduated at the Boston University in 1877; at the School of Oratory there in 1879; at the Law School of the same institution in 1881; and in 1882 at the Harvard Medical School. He is founder and editor of ‘Success,’ and vice-president of the Success Company, and is the author of many works, among which are: ‘Pushing to the Front’ (1894); ‘How to Succeed’ (1896); ‘The Secret of Achievement’ (1898); ‘Character the Grandest Thing in the World’ (1899); ‘The Hour of Opportunity’ (1900); ‘Talks with Great Workers’ (1901); and ‘Stepping Stones’ (1902).

Mardi Gras, mär′dē grä, Shrove Tuesday, the last day before Lent. (See CARNIVAL.) In the United States the day is observed in New Orleans and Memphis with processions, masquerade balls, and other gay entertainments.

Mardonius, mär-dō′nĭ-ŭs, Persian general, was the son of the Satrap Gobryas, and son-in-law of Darius Hystaspes. He commanded the first Persian armament sent against Greece, 492 B.C., when a storm at Mount Athos destroyed his fleet, and his army was beaten in Macedonia. He accompanied Xerxes in his invasion of Greece, of which he had been the chief promoter; and after the battle of Salamis, and the return of Xerxes to Asia, Mardonius was left in occupation at Athens, which he held for 10 months. According to Herodotus he was defeated by Pausanias, and probably killed at the battle of Platæa, 479 B.C.

Mare Clausum, mā′rē klâ′sŭm, a Latin phrase meaning closed sea, or that portion of the sea under the jurisdiction of a particular nation or government, as distinguished from the high sea. See INTERNATIONAL LAW.

Mare Island, Cal., in San Pablo Bay, and a part of Solano County; 28 miles north of San Francisco, and opposite the city of Vallejo. A United States naval station, one of the largest in the country, is on this island. It has wet and dry docks, ordnance yards, marine barracks, a hospital, an observatory, repair shops, and at the southern extremity of the island, a lighthouse.

Maree, Loch, lŏʜ mạ-rē′, Scotland, a lake in the west of Ross-shire, forming a long and comparatively narrow expanse, stretching southeast to northwest for 12½ miles with an average breadth not exceeding 1½ miles. Its depth in most places is 60 fathoms; it has never been known to freeze. The scenery along its shores is bold and picturesque, and its surface is studded with 24 wooded islands, on one of which are found the remains of an ancient chapel, with a graveyard. The loch discharges itself into Loch Ewe by a small river of the same name.

Mareia, mä-rā′ạ, **Lake.** See MAREOTIS, LAKE.

Maremma, mä-rĕm′mä, Italy, low swampy tracts extending along the west coast of Tuscany from the mouth of the Cecina to Orbitello; length, 92 miles; breadth, from 6 to 20 miles; area, about 1,000 square miles. Formerly these regions were fruitful, healthful, and populous; but after the 15th century the neglect of the water-courses of the district allowed the formation of marshes, and now they generate tertiary fevers, and present an aspect of dreary desolation during the summer months, when the inhabitants flee from the pestilential exhalations of the soil. In winter, on the other hand, the Maremma are inhabitable, and afford a luxuriant pasturage for cattle, which graze in summer on the Apennines. The district is gradually being reclaimed and improved.

Marengo, mä-rĕng′gō, Italy, a northern village, near the Bormida, three miles southeast of Alessandria. Its name is connected with the defeat of the Austrians by Napoleon 14 June 1800. The Austrians under Melas were at first successful, but French reinforcements arriving, the cavalry charge of the younger Kellermann turned what looked like certain defeat into a decisive victory. The forces engaged were 33,000 French, and 30,500 Austrians; the French lost in killed and wounded 7,000, the Austrians 6,400, while 3,000 were made prisoners.

Maren′jo, Iowa, city, county-seat of Iowa County; on the Iowa River, and on the Chicago, Rock Island & Pacific railroad; about 85 miles east by north of Des Moines. It is in a fertile agricultural and stock-raising locality. The chief manufactures are dairy products, agricultural implements, and flour. It is the trade centre for a large part of Iowa County. Pop. (1910) 1,786.

Mareotis, mä-rē-ō′tĭs, or **Mariut,** mä-rē-oot′, Egypt, a lake separated from the Mediterranean on the west by the long narrow belt on which Alexandria stands, and communicating on the north with Lake Madieh. In the southwest it terminates in a long narrow creek; the main expanse is about 28 miles long by 20 broad. It was at one time deep enough for inland navigation, and had its shores covered with beautiful gardens and vineyards; but having been cut off from the Nile, which supplied its water, it became dry and its area was cultivated. During the siege of Alexandria in 1801 the British let the sea into it, and it now yields much salt by evaporation.

Mare's Tail, a genus (*Hippuris*), of plants with whorled narrow leaves and small inconspicuous flowers set in their axils. They are aquatic or marsh plants. *H. vulgaris* is very common in Europe and has become naturalized in the interior of the United States.

Maretzek, mä'rĕ tsĕk, **Max,** American musician: b. Brunn, Austria, 28 Jan. 1821; d. Pleasant Plains, Staten Island, 14 May 1887. He was educated at the University of Vienna, but desirous of a wider field went to London and was connected for a time with its Italian Opera as chorus-master, writing in addition some music. In 1848 he came to New York, where he was appointed leader of the orchestra at the Italian Opera and subsequently at the Astor Place Theatre and the Grand Opera House. He wrote the operas of 'Hamlet,' 'Sleepy Hollow,' and 'Crotchets and Quavers' (1858). Under his management many notable operas and artists, among the latter Adelina Patti and Pauline Lucca, were presented to American audiences.

Marforio, mär-fō'rĭ-ō, the popular name of a colossal statue representing the river Rhine, or Danube, or river God, standing in the court of a wing of the Capitol at Rome. The name Marforio is a corruption of *Martis forum* (the forum of Mars), in the entrance of which the statue originally stood.

Margaret, Saint, queen of Scotland, elder sister of Edgar Ætheling, and granddaughter of Edmund Ironside: b. Hungary about 1045; d. Edinburgh 16 Nov. 1093. Shortly after William the Conqueror had established himself on the English throne she and her brother Edgar went to Scotland and placed themselves under the protection of Malcolm Canmore, the Scottish king, who in 1070 became her husband. She was characterized by great devotion to the church, and it was largely through her influence with the king that the Scottish Church was brought into conformity with those of England and the Continent. She is said, moreover, to have elevated the manners of the Scottish court, and introduced great improvements in needlework, embroidery, and other similar arts. In her personal life, and the great care with which she educated her children, she set a noble example to the people of the somewhat rude and uncultured kingdom. In 1250 she was canonized. Her daughter Matilda married the English king, Henry I., and thus the old Anglo-Saxon line became united with that of the usurping Normans. There is an ancient life of Saint Margaret, written in Latin, it is commonly believed by her confessor Turgot, bishop of St. Andrews. The Bodleian library at Oxford contains a copy of the Gospels which once belonged to her.

Mar'garet, queen of Denmark, Norway, and Sweden, daughter of Waldemar III., king of Denmark: b. Copenhagen 1353; d. 28 Oct. 1412. She was married to Hakon, king of Norway, in 1363, and the death of her husband in 1380 placed Norway in her hands; that of her son Olaf in 1387 enabled her to secure the throne of Denmark, to which she had previously brought about his election; and after defeating Albert, the Swedish king, she also obtained possession of the throne of Sweden. She endeavored to place the union of the three kingdoms on a permanent basis by the celebrated Act of Union, or Treaty of Calmar (1397). She died after having raised herself to a degree of power then unequaled in Europe from the time of Charlemagne. She is sometimes styled "The Semiramis of the North."

Margaret of Anjou, ăn'joo or äṅ-zhoo, queen consort of Henry VI. of England: b. probably at Pont-à-Mousson, Lorraine, 23 March 1430; d. near Saumur in Anjou, 15 Aug. 1482. She was the daughter of René the Good, of Anjou, titular king of Naples, and was married to Henry in 1445. The imbecility of the king made her practically regent, and her power being contested by the Duke of York, a claimant of the throne by an older line, the protracted Wars of the Roses began. At first victorious, she was afterward compelled to flee to Scotland, but raising an army in the north, she secured, by the battles of Wakefield (1460) and Saint Albans (1461), the death of York, and the release of the king. Her army, however, was soon afterward annihilated at Towton (1461), and Edward (IV.), the son of the late Duke of York, was declared king. She succeeded in obtaining assistance from Louis XI. of France, but was once more defeated, and took refuge in that country. Warwick then became embroiled with the young king, and determined to replace Henry on the throne. Edward was in turn obliged to escape to the Continent, but obtaining assistance from the Duke of Burgundy, returned and defeated Warwick at Barnet (1471). Margaret, collecting her partisans, fought the battle of Tewkesbury (1471), and was totally defeated. She and her son were made prisoners, and the latter, when led into the presence of the royal victor, was killed. Henry soon after died or was murdered in the Tower, and Margaret remained in prison four years. Louis XI. ransomed her for 50,000 crowns. See HENRY VI.; ROSES, WARS OF THE.

Margaret of Austria, governor-general of the Netherlands, and daughter of Maximilian I. of Austria: b. Brussels 10 Jan. 1480; d. Mechlin 1 Dec. 1530. She was educated at the French court; was betrothed to the Dauphin Charles, who married Anne of Brittany; married John, the Spanish crown-prince, in 1497; and, after his death in the same year, married Philibert of Savoy in 1501, only to be widowed again in 1504. Three years afterward her father made her regent of the Netherlands, where she ruled with much ability although a bitter enemy of the Reformation. She took a prominent part in the peace of Cambrai in 1529, which is called, because negotiated by her and Louise of Savoy, the "Paix des Dames."

Margaret of Flanders, countess of Flanders and Hainault, sometimes called Margaret of Constantinople: b. Valenciennes about 1200; d. Lille 1279. She was a daughter of Baldwin IX. of Flanders and Hainault, who was succeeded by Margaret's older sister, Jeanne. Margaret's husband, Bouchard, was seized and killed by Jeanne, upon whose death Margaret came to the crown in 1244. Her reign was peaceable, save for the quarrels between her children by Bouchard and those by Guillaume of Dampierre.

Margaret of Navarre, nạ-vär, or **of Valois,** or **of France,** French princess, daughter of Henry II.: b. St. Germain-en-Laye, France, 14 May 1553; d. Paris 27 March 1615. She married in 1572 Henry of Navarre, afterward Henry IV. of France. It was entirely a marriage of policy, and on Henry's accession to the throne, their marriage was dissolved by mutual consent. She resided thereafter in Paris where her house became the rendezvous for the learning and fashion of the time. Some very agreeable poems by her are extant, and her 'Memoirs' (1842) are extremely curious.

Margaret of Parma, regent of the Netherlands, a bastard of Charles V. of Spain by a Flemish woman: b. Oudenarde 1522; d. Ortona 1586. Brought up in Brussels, she was married to Alessandro de' Medici in 1536, and in 1538 to Ottavio Farnese, duke of Parma, to whom she bore the great general Alexander Farnese. In 1559 Philip II. made her staatholder of the Netherlands. There she sided with Granvella, introduced the Inquisition, and provoked the provinces to revolt by her strong, masculine policy. She resigned in 1567 when Alva was sent to the Netherlands.

Margaret Tudor, queen of Scotland, wife of James IV., and daugher of Henry VII. of England: b. Westminster 29 Nov. 1489; d. Methven Castle 18 Oct. 1541. She was married to the king of Scotland when 14; bore him three children, of whom two, James, later fifth king of Scotland of that name and father of Mary Stuart, and Margaret, mother of Lord Darnley, survived her; and after the king's death (1514) married Douglas, Earl of Angus, from whom she was divorced in 1527, to marry soon after Henry Stewart, Lord of Methven. By descent from Margaret Tudor her great-grandson, James VI. of Scotland, was Elizabeth's successor as James I. of England.

Margaret, or Marguerite of Valois, väl-wä, Queen of Navarre: b. Angoulême 11 April 1492; d. Paris 27 March 1549. (Variously known as Margaret of Angoulême, of Alençon, and of Navarre.) She was the sister of Francis I. of France, was brought up at the court of Louis XII., married the Duke of Alençon in 1509, became a widow in 1525, and in 1527 married Henry d'Albret, titular king of Navarre. She never reigned over Navarre, but resided at the French court or kept a court of her own at Nérac and Pau. She was acquainted with the principles of the Protestant reformers, and not only afforded protection to reformed divines, but used her influence with her brother Francis to the same purpose, and was a great patroness of men of letters. In 1533 she published a religious poem, 'Le Miroir de l'Ame Pécheresse,' which incurred the censure of the Sorbonne as heretical. In 1547 a collection of her poems and other pieces was printed under the title of 'Marguerites de la Marguerite des Princesses.' The 'Heptaméron. ou sept Journées de la Reyne de Navarre,' a famous collection of tales long attributed to her, is at present regarded as of composite authorship. She left one child, Jeanne d'Albret; afterward mother of Henry IV. Her letters have been published in modern times. Consult: Comtesse d'Haussonville, 'Marguerite de Valois' (1870); Lotheissen, 'Königin Margaret von Navarre' (1885); Freer, 'Life of Marguerite d'Angoulême' (1895).

Margaret Sidney. See LOTHROP, HARRIET MULFORD STONE.

Margaretta, The, a British armed schooner, captured by Americans near Machias, Maine, 12 June, 1775, in the first naval contest of the Revolution. In April 1774, Captain Ichabod Jones sailed into the harbor of Machias, and there, on account of complications caused by the Boston Port Bill (q.v.), he remained for a year, with his vessel hauled up. When news of the battle of Lexington reached Machias, Jones was loading two sloops, the Unity and the Polly, for Boston, whither he soon sailed. The whole country was now excited over the Port Bill, and in Boston it had caused much distress.

Jones wished to return to Machias with provisions, of which the people there were in want. Admiral Graves, the British officer in charge of Boston Harbor, granted him permission to sail on condition of his bringing back lumber for he use of the British troops, and the admiral ordered the Margaretta, a cutter of about 100 tons, carrying about 40 men, to accompany Jones to his destination to see that this condition was fulfilled; also that the American skipper should convey to Boston the stores of an armed vessel lately cast away. Jones is said to have been favorable to the British, whose protection at this time he may have solicited. His two sloops, convoyed by the Margaretta, arrived at Machias 2 June 1775; but many of the citizens, declaring that he should carry no lumber to Boston, organized for resistance to the enforcement of Graves' order.

The leader of this opposition was Benjamin Foster, a colonial soldier, who had been present at the capture of Louisburg from the French. A secret meeting was called, and on Saturday, 10 June, men of Machias and neighboring settlements gathered in the woods to consider the advisability of attempting to take the sloops, capture the Margaretta, and make prisoners of the cutter's officers and crew. Among those that assembled was Jeremiah O'Brien, who, with several brothers, participated in the subsequent capture. During the discussion Foster stepped across a small brook running near, and called on all in favor of the attempt to follow. The majority followed him, and then "a unanimous declaration of war" was made.

On Sunday, 11 June, Jones and the principal officers of the Margaretta being at church, Foster and others started to take them into custody; but, getting the alarm, they escaped by jumping from the windows — Jones fleeing to the woods, while the British officers returned to the Margaretta and weighed anchor, threatening to fire on any who should interfere with Jones' sloops.

In spite of this threat the Americans determined to carry out their purpose. When the enemy was sighted, on Monday, the 12th, Jeremiah O'Brien was chosen to lead the movement, and while he took 40 men on board the Unity, Foster, with another party, boarded the Falmouth Packet, a schooner lying at hand. The bold defiers of British force had only "a few charges of powder and ball for 20 fowling-pieces [muskets?], 13 pitchforks, and 10 or 12 axes," the powder and balls being nearly all on O'Brien's vessel. As they approached the Margaretta she was ready for action, and her commander, Moore, gave warning that he would fire if they came nearer. O'Brien called upon him to surrender, while Stevens, O'Brien's lieutenant, told Moore to "fire and be damned!" To avoid action, Moore crowded all sail and stood out to sea. But the Unity was the better sailer, and as she overhauled them the British opened fire, which the heroes of the «fowling-pieces» returned with effect. The vessels coming together, a short musketry fight ensued. Moore himself threw hand-grenades, but was shot down. The Americans — O'Brien at their head — boarded the cutter and soon had complete possession of her.

In this plucky exploit one of the American party was killed and four wounded, one mortally. On the Margaretta four were killed besides her commander, who died of his wound. Her captors triumphantly took the Margaretta to Machias the same day, and her crew were held until July as prisoners of war. So ended «one of the most bold, energetic, and extraordinary occurrences of the times.» With the armament of the Margaretta — four 3-pounders and 14 swivels — the Unity was fitted out, and she was thenceforth called the Machias Liberty.

Margar'ic Acid, or **Heptadecoic Acid**, a name now applied to an acid having the formula $C_{17}H_{34}O_2$, which is said to occur in adipocere (q.v.), and which may also be prepared by boiling cetyl cyanide in alcoholic potash. It was formerly given to a supposed acid having the same formula, which was believed to occur in connection with the saponification of natural fats; but it has been shown by Heintz that the earlier «margaric acid» was merely a mixture of palmitic and stearic acids.

Mar'garin, or **Margarine**, a fatty substance, obtained from lard, and from certain vegetable oils. It was formerly believed to be a distinct fat, or compound of glycerin with «margaric acid» (q.v.); but it is now known to be merely a mixture of stearin and palmitin. See OLEOMARGARINE.

Margarit, or **Marguerit**, **Berenger**, a Spanish general, who lived in the 12th century. In command of a fleet he was sent by William II., king of Sicily, to succor Tyre, besieged by Saladin in 1188. Margarit, with a fire-ship, burned several of the enemy's ships, while Conrad, governor of Tyre, made a sortie. Attacked on both sides at once, Saladin only just managed to find shelter on an undamaged ship, and escaped. The brilliant conduct of Margarit on this occasion gained for him from Saladin the names of King of the Sea and the New Neptune.

Margarit, or **Marguerit**, **John**, a Spanish cardinal: b. Gerona 1415; d. Rome 1484. Successively bishop of Elne, of Gerona, and of Patti (Sicily), he received several important missions under Alphonse V., and became ambassador to Rome under John II., who appointed him chancellor of Aragon. He quelled the troubles which were disturbing Catalonia, and received the cardinal's hat in 1483. He was the author of 'Paralipomenon Hispaniæ' (Granada 1545), a history of Spain from the fabulous arrival of Hercules in the Peninsula, to the reign of Theodosius the Great.

Margarit, or **Marguerit**, **Peter**, a Spanish navigator who lived at the end of the 15th century. He was the nephew of Cardinal Margarit, and left the court of Ferdinand V. in 1492, to embark with the fleet of Christopher Columbus, from whom he separated after some dissensions. According to Blasius he discovered the Marguerite Islands, and gave to them his name. Other authors aver these islands were named after the pearls which are found on their shores.

Margarita, mär-gä-rē'tä, Venezuela, an island off the northeast coast, in the Caribbean Sea, about 30 miles north of Cumana. In 1901 it was made a province and is known by the name of Nueva Esparta. Its area is 450 square miles. This island was discovered by Columbus in 1498. The name Margarita, meaning «pearl» was given to it because of the valuable pearl fisheries once found in its surrounding waters.

The surface is broken by two mountain chains, the highest point of one is nearly 4,000 feet. Near the centre is a lagoon, surrounded by low land. Much of the soil is fertile, but the chief industries are fishing, preparing salt for market, and cattle-raising. The capital of the province is Asunción. The inhabitants are nearly all Indians who have long been civilized. Pop. about 40,500.

Mar'garite, or **Pearl Mica**, a native hydrous silicate of aluminum and calcium, having the formula $H_2CaAl_4Si_2O_{12}$, and usually occurring in laminated forms, like mica. Its crystals, when they occur, belong to the monoclinic system. Margarite is translucent or subtranslucent, with a vitreous or pearly lustre. It occurs in various colors, but predominantly in gray, with perhaps a reddish tint. It has a hardness of from 3.5 to 4.5, and a specific gravity of about 3. Margarite usually occurs in connection with emery or corundum, from which it is often obviously derived.

Margaritone, Italian painter, architect, and sculptor: b. Arezzo 1219; d. 1289. Called MARGARITONE D'AREZZO after his native place, he attained the first rank as an artist of the Greek school, and was held in high esteem by Pope Urban IV. Jealousy at the success of Cimabue is said to have shortened his days. He painted a great number of frescoes, none of which now exist. Among the few remaining pictures from his brush are Saint Francis in the museum at Siena; a Madonna in the Church of Saint Francis at Arezzo; Christ, in the Church of San Croce at Florence; the Eternal Father with the angels in the Church of Saint Bernardin at Perugia. Painting and sculpture are mingled in his Tomb of Pope Gregory X., at Arezzo; his sculptured works are chiefly of wood. Among his architectural works are the cathedral of his native city and the governor's palace at Ancona.

Margate, mär'gāt, England, a seaport and popular summer watering resort of Londoners, in Kent, on the Isle of Thanet, 64 miles by rail east by south of London. The restored parish church of Saint John the Baptist dates from 1050. Margate is patronized annually by about 200,000 visitors.

Margate-fish, a handsome, pearly white, brown-striped fish (*Hæmulon album*) of West Indian waters, important as a food-fish, and ordinarily weighing about five pounds. It is caught about rocky reefs, in deep water, where it spawns in summer; and at night it comes in shore to obtain the small animals which swarm in the shallows. It is called jallao by Spanish-speaking fishermen, and market-fish, margaret-grunt, etc., by the English-speaking fishermen of Key West and the Bahamas.

Mar'gay, a South American forest-dwelling wildcat (*Felis tigrina*), which is most variably colored and spotted. It is sometimes domesticated in Brazil.

Margherita, mär-gä-rē'tä, queen dowager of Italy: b. Turin 20 Nov. 1851. She is the daughter of Ferdinand, Duke of Genoa. In 1868 she was married to Humbert, then crown prince of Italy, who ascended the throne of Italy in 1878. In that same year an attempt was made upon the life of the king, and the nervous shock to the queen seriously affected her health for a number of years. Her winning personality and dignified performance of her duty as queen gained her wide popularity in Italy. In 1900 her husband was assassinated and their son, Victor Emmanuel III., succeeded him as king.

Margoliouth, mär-gō'lĭ-oot, **David Samuel**, English Oriental scholar: b. London 17 Oct. 1858. He was educated at Winchester and Oxford and has been professor of Arabic at Oxford from 1889. Among his published works are: 'Analecta Orientalia at Poeticam Aristoteleam' (1888); 'Chrestomathia Baidwiana' (1894); 'Letters of Abul 'Ala' (1898); 'Lines of Defence of the Biblical Revelation' (1900); 'Religions of Bible Lands' (1902).

Mar'grave (German, *Markgraf*), in mediæval times in continental Europe, a commander intrusted with the protection of a *mark*, or district on the frontier. As early as the times of Charlemagne marks and margraves appear. The margraves stood immediately under the German kings and emperors. In the 12th century margraviates became hereditary, and at last the margraves acquired the rank of princes of the empire, between counts and dukes.

Marguerite, mär'gĕ rĕt, a popular name for several flowers of the order *Compositæ*. The blue marguerite (*Felicia amellodes*), or blue daisy, is a native of southern Africa, and has long been popular in greenhouses and window gardens because of its simple culture and large solitary flower-heads. The Paris daisy or marguerite (*Chrysanthemum frutescens*), a native of the Canary Islands, was introduced into cultivation in Great Britain about the close of the 18th century and has continued a popular florist's flower ever since. It is the one usually obtainable throughout the year in the stores, but especially during the winter. Because of a close resemblance, the name is applied to its near relative, the ox-eye daisy (*C. leucanthemum*), which is common in mismanaged pastures and fields especially in the New England and adjacent States. The Reine marguerite (*Callistephus hortensis*), is better known in America as China aster (see ASTER) and is one of the most popular out-of-door annuals of the garden, being easily grown from seed and readily adaptable to any garden soil. The English daisy (*Bellis perennis*) is also called marguerite, but less frequently. See DAISY.

Maria Christina, ma-rē'ä krĭs-tē'nä, queen of Spain: b. Naples 27 April 1806; d. Havre, France, 22 Aug. 1878. She was a daughter of Francis I., king of the Two Sicilies and was married to Ferdinand VII. of Spain in 1829. Upon Ferdinand's death in 1833, Maria Christina by her husband's will became regent until her daughter, Queen Isabella, should become 18. A civil war which was waged until 1840 ensued, its purpose being to place Don Carlos on the throne, and its outcome was for a long period doubtful, but the queen-regent appeared to care only for her chamberlain, Don Fernando Muñoz, with whom she secretly contracted a morganatic marriage. Her policy as regent was entirely subject to the will of the minister of the day which naturally resulted in a reign alternately liberal and despotic. When she affixed her signature to the law concerning the Ayuntamientos the public protested so strongly that she was obliged to resign the regency to the prime-minister Espartero in 1840. In 1843, after the fall of Espartero, she returned to Madrid and in 1844 publicly married Muñoz, who was made Duke of Rianzares. A revolution in 1854 compelled her to flee the country and her return to Spain in 1864 was followed by the revolution which dethroned Queen Isabella in 1868 and she was again exiled and though allowed to return to Madrid after the accession of Alfonso XII., she died in exile.

Maria Christina, queen of Spain: b. Austria 21 July 1858. She was an Austrian archduchess, daughter of Archduke Karl Ferdinand of Austria and was married by proxy to Alfonso XII. of Spain in 1879. At the death of Alfonso XII. in 1885, she was apointed queen-regent during the minority of her daughter Queen Mercedes, who was succeeded six months later by Alfonso XIII., a posthumous son. The queen-regent faced a difficult problem; she was a foreigner, the people were unsympathetic, and the political and financial condition of the country was in a precarious state. She formed a new cabinet with Sagasta, the Liberal leader at its head, and soon won the hearts of her people by her wise and able rule. Throughout the time of her regency she commanded the respect and admiration of the world as well as her own country for her clear far-sighted administration of the affairs of state and her careful training of the young king whom she endeavored to inspire with her own high sense of the responsibilities of his position. Even the disastrous outcome of the Spanish-American war failed to unsettle the stability of her government which on 17 May 1902 she surrendered into the hands of her son, Alfonso XIII.

Maria II. da Gloria, dä glō'rē-ä, queen of Portugal: b. Rio de Janeiro, 4 April 1819; d. Lisbon 15 Nov. 1853. She was a daughter of Dom Pedro I. of Brazil and on the death of her grandfather, John VI. of Portugal in 1826, her father ceded to her the succession to the throne. Her uncle, Dom Miguel, to whom she was betrothed was appointed regent, but in 1828 upon the sailing of the young queen for Spain he usurped the throne and barred the landing of the queen. In 1832–3 Dom Pedro instigated a civil war against his brother and through the intervention of England and France, Maria was placed on the throne in 1834. She married Duke Ferdinand of Saxe-Coburg and though retaining her throne had a troubled and rather unsuccessful reign. Upon her death her son Pedro V. ascended the throne.

Maria Leszczynska, lĕs-chĭn'skä, queen of France: b. Breslau 23 June 1703; d. Versailles 24 June 1768. She was a daughter of Stanislas Leszczynska, king of Poland, and shared the obscurity which followed upon his exile. Her marriage to Louis XV. in 1725 was arranged by the regent Duc de Bourbon and the minister Fleury and was regarded as an intrigue to further their interests since it antagonized Spain by sending back the young infanta with whom an alliance had been projected. The queen after a brief period in which she tried to control state matters lived very quietly and was noted for her charities. Consult: d'Armaille, ‹La Reine Marie Leszczynska› (1870); Des Reaux, ‹Le Roi Stanislas et Marie Leszczynska.›

Maria Louisa, loo-ē'ză, second wife of Napoleon I.: b. 12 Dec. 1791; d. Vienna 17 Dec. 1847. She was the eldest daughter of the Emperor Francis I. of Austria and Maria Theresa, daughter of Ferdinand, king of Naples. Her marriage with Napoleon in 1810, after his divorce from Josephine, seemed to promise permanency to his dynasty and peace to the Continent, and her progress toward Paris through the different provinces of the kingdom formed a kind of triumph. In 1811 she bore him a son, to whom was given the title of King of Rome. In 1813, during Napoleon's absence at the war, he named her regent of the kingdom. After his overthrow she returned to Vienna, and remained there during the Hundred Days. In 1816 she received, with the title of Imperial Majesty, the Duchies of Parma, Piacenza, and Guastalla, and at a later period made a morganatic marriage with her chamberlain, Count Neipperg. She governed her duchies generally with mildness, but the latter part of her reign was much disturbed by revolutionary outbreaks and the very violent means taken to repress them.

Maria Louisa, Order of. See ORDERS AND DECORATIONS.

Maria Theresa, tē-rē'sa (Ger. tă-rā'zā), German empress, queen of Hungary and Bohemia, archduchess of Austria; b. Vienna 13 May 1717; d. there 29 Nov. 1780. The oldest daughter of the emperor Charles VI., she was carefully educated, was named heir to the throne by the Pragmatic Sanction, and in 1736 married Stephen, duke of Lorraine, who became grand-duke of Tuscany in the next year, and who in November 1740, a month after Maria's accession to the throne of Hungary, Austria and Bohemia, was named joint regent with her. France and Bavaria invaded Bohemia; and at the same time she was beset by Frederick the Great in Silesia, by Spain and Naples in Italy, and by the counter claims of Charles Albert, who was proclaimed first archduke of Austria and then German emperor. She fled from Vienna to Presburg, convoked the Diet, raised a Hungarian army, won the alliance of England, made a secret peace with Prussia, surrendering Silesia and Glatz, and gained peace by the treaty of Aix-la-Chapelle, October 1748, securing the election of her husband as German emperor in return for the cession to Spain of Parma, Piacenza and Guastalla. To revenge herself on Frederick she formed an alliance with Russia, and, by the help of her chancellor, Kaunitz, with France. With the further help of Sweden and Saxony she was preparing to strike at Prussia, when Frederick forestalled her by striking the first blow and opening the Seven Years' War (q.v.). This terrible struggle availed Austria nothing and Maria Theresa had to admit Prussia's right to Silesia in the Peace of Hubertsburg 15 Feb. 1763. Francis I., her husband, died 18 Aug. 1765, and Maria associated with her as emperor her oldest son, Joseph II., but kept in her own hands everything save military administration. Seven years afterward, upon the first partition of Poland, she received Galicia and Ludomeria; and in 1775 Bukovina was granted to Austria by Turkey. The Peace of Teschen, closing the War of the Bavarian Succession, brought Austria the Inn valley in 1779; but the Princes' League (Fürstenbund) under the lead of Frederick II., struck a heavy blow at Austrian supremacy. Though best known for her part in European politics, Maria Theresa was equally great in interior administration; Austrian finance was revived, agriculture encouraged and higher education fostered. The Empress was a strict Catholic and an enemy of the Protestant Reformation, but in the latter part of her reign under the influence of her free-thinking son's policies, she was induced to enact some anti-ecclesiastical legislation, which he subsequently developed into persecutions. She was a pure and noble woman, strikingly beautiful in her youth. Ten of her 16 children survived her. Monuments to Maria Theresa are to be found in Klagenfurt, Vienna, and Presburg. Her letters to her children and her friends were edited by Arneth (1881), who wrote ‹Maria Theresia› (1888). Consult also de Broglie, ‹Marie Thérèse› (1888); de Villermont, ‹Marie Thérèse› (1895); Wolf and Zwiedineck-Südenhorst, ‹Oesterreich unter Maria Theresia› (1884); Bright, ‹Maria Theresa› (1897).

Maria Theresa, Order of. See ORDERS AND DECORATIONS.

Mariamne, mā-rĭ-ăm'nē, granddaughter of Aristobulus and Hyrcanus, the high-priest, and wife of Herod the Great. Her history is related by Josephus from whom we learn that Herod was devotedly attached to her. She was condemned to death through the machinations of Salome, her husband's sister, on a false charge of adultery, 28 B.C. She met her fate with an intrepidity worthy of her noble ancestry, and was bitterly deplored by the king after her decease.

Mariana, Juan, hoo-än' mä-rē-ä'nā, Spanish historian; b. Talavera 1536; d. Madrid 17 Feb. 1623. Taking holy orders he entered the Society of Jesus. To his training at the University of Alcala he owes the pure taste and eloquence of his writings. He taught theology for 13 years with distinction in Rome, Sicily, and Paris, returning to the Jesuits' College at Toledo in 1574, where he wrote his ‹Historia de Rebus Hispaniæ› (first edition, Toledo, 1592), in elegant Latin, but afterward translated it into Castilian. His tone is impartial, though he loves Spain and admires Spanish virtue. Though a Jesuit he complains of Pope Alexander VI. Though a Spaniard he is not blindly prejudiced in favor of his king. He describes with sorrow the conquest of Naples; and his censure of Ferdinand is moderated only by considering his good qualities as personal, his bad ones as common to all princes. He has not, however, much claim to originality and borrows largely from Zurita (q.v.). Four editions of the translation appeared during his lifetime, each with corrections and additions. An English translation was made by Stephens, the continuator of Dugdale's ‹Monasticon› (London, 1609, folio).

Mariana, mā-rē-ā'na, in American colonial history, a name given by John Mason to the tract or territory granted to him between the Salem River and the Merrimac. Here he founded an agricultural settlement and formed the Laconia company in 1629. Mason returned to England in 1633 and died there two years later. In 1691 his heirs sold all his lands and rights in New Hampshire to Gov. Allen.

Mariana (mä-rē-ä'nä) **Islands.** See LADRONE ISLANDS.

Marianna, mā-rĭ-ăn'ạ, Ark., town, county-seat of Lee County; on L'Anguille River, and on the Saint Louis, Iron Mountain & Southern railroad; about 158 miles east of Little Rock. It is in a fertile agricultural region in which cotton is one of the principal crops and in the vicinity are large forests. The chief industrial establishments are lumber-mills, cotton-gins, cotton-compresses, and cottonseed-oil mills. The town owns and operates the waterworks. Pop. 1,900.

Mariazell, mä-rē-ä-tsĕl', Austria, a picturesque mountain village in the north of Styria, near the Salza, 60 miles southwest of Vienna. It is a noted pilgrim resort, annually visited by about 200,000 persons, attracted by the celebrated image of the Virgin and child, enshrined in a handsome church founded in 1363, and rebuilt in 1827.

Maribois. See NAGRANDIANS.

Maribojoc, mä-rē-bō-hŏk', a pueblo of the province of Bohol, situated on the southwestern coast on Maribojoc Bay, eight miles north of Tagbilaran, two miles from the mouth of the Abalán River. It is an important road centre. Pop. 10,900.

Maricopa, mä-rē-kō'pä, or **Coco-Maricopa,** an Arizona tribe of Indians, a branch of the Yumans, formerly inhabiting the region around the confluence of the Gila and Colorado rivers. Their descendants and the Pimas, with whom they subsequently confederated, are now to be found in the Gila River Reservation to the number of about 400. In their aboriginal state their dress was of the scantiest description, and their dwellings and storehouses were of woven straw and cornstalks over a pole framework. They were an agricultural people and raised large crops by irrigation. Under missionary influence they have been civilized and are now noted for their industry, their efforts at self-improvement, and their manufactures of cotton cloth, baskets, and pottery.

Marie Antoinette, măr'ĭ ăn-toi-nĕt' (Fr. mä-rē äṅ-twä-nĕt), queen of France: b. Vienna, Austria, 2 Nov. 1755; d. Paris 16 Oct. 1793. She was the daughter of the Emperor Francis I. and the celebrated Maria Theresa. She left Vienna for Versailles in 1770, when only 15 to marry the young Duc de Berri, afterward Louis XVI. of France. When her husband ascended the throne in 1774, she gained the affections of the people by repeated acts of generosity. It was, however, soon observed that her natural freedom of manner brought on her the criticism of enemies about the court. It was thought, too, as many believe, with reason, that she was to a certain extent controlled by her mother as an Austrian spy. An extraordinary occurrence added fresh force to calumny and tarnished the fair name of the queen, who was not to blame. This was the affair of the "Diamond Necklace," in which the Cardinal Louis de Rohan, the great quack Cagliostro, and the Countess de Lamotte were the chief actors. It was certain that Marie Antoinette had great influence over the king, and that she constantly opposed such measures of reform and economy as had been proposed. Her extravagance was regarded by the people as one of the chief causes of their poverty. Her unpopularity increased, and the general indignation was raised to the highest pitch by the enthusiastic reception given her at the banquet on 1 Oct. 1789, where the white Bourbon cockades were worn and the national cockade trampled under foot. The insurrection of women, the attack on Versailles, and the transfer of the royal family to Paris followed in a few days. It was the queen who advised the flight of the royal family from Paris to join Bouille's army in June 1791, which ended in their capture at Varennes. From that time they were viewed as traitors. On 10 Aug. 1792, the last day of the royalty, the queen exerted all her power to induce the king to resistance. This he thought was vain, and he was led with his consort before the legislative assembly. She heard his deposition announced, and then accompanied him to the prison of the Temple. There, deprived of every semblance of royalty, she displayed magnanimity and patient endurance. In August 1793, she was removed to the Conciergerie, and in October was brought before the revolutionary tribunal. She was charged with having dissipated the finances, exhausted the public treasury, corresponded with foreign enemies of France, and favored its domestic foes. She replied with firmness and decision, and heard her sentence pronounced with perfect calmness. On the same day she was guillotined. Marie Antoinette's faults were due in great measure to her defective education and difficult position. Her expiation of them made her a general object of pitying interest. Consult: Lescure, 'La vraie Marie Antoinette' (1863); Campan, 'The Private Life of Marie Antoinette' (1887); and Bicknell, 'The Story of Marie Antoinette' (1897).

Marie de France, mä-rē dė fräṅs, French poetess of the 12th century, a native of Ile-de-France, whence her surname, who spent her life in England, where she was well known at the court of Henry II. Her 'Lais,' largely based on Breton stories, and full of Celtic spirit and pathos; fables, a revision under the title 'Isopet' (that is, Æsop) of an English collection; and a tale, 'Le Purgatoire de St. Patrice,' make up the body of her work. The 'Lais' are edited by Warnke (1900), and the 'Purgatoire' by Jenkins (1894); each edition has a valuable preface.

Marie Galante, gä-läṅt, West Indies, an island, one of the Lesser Antilles, belonging to France, about 15 miles southeast from Guadeloupe. The area is about 60 square miles. The chief productions are sugar, coffee, tobacco, indigo, and cotton. It is a dependency of Guadeloupe. Columbus discovered it in 1493, and named it from his vessel, the Santa Marie. The French occupied it in 1647, and lost it several times. In 1825 it suffered severely from the hurricane which desolated Guadeloupe. Pop. 14,268, chiefly negroes.

Marie de Médicis, dė mä-dē-ses, queen of France: b. Florence 26 April 1573; d. Cologne 3 July 1642. She was the daughter of Francis I., grand-duke of Tuscany, and was married by proxy, 5 Oct. 1600, to Henry IV. of France, with whom she constantly quarreled, partly because of his inconstancy and his open favor to the Marquise de Verneuil, and partly because of her own haughty, obstinate character, which was not unmixed with ambition. For years she urged him to have her crowned queen; the ceremony took place 13 May 1610, and on the next day the king was assassinated. Marie was accused of complicity in the plot, but the charge is not proven. For seven years she acted as regent and showed a strong friendship for Spain and the Catholic Church, being advised by the nuncio and the Spanish ambassador as well as by such favorites as the Concinis. She quarreled with her son, later Louis XIII., was reconciled to him by Richelieu, and upon her attempt to displace the latter was forced by that great minister again to leave court in 1630. Her last years were spent in exile in Belgium, England, and Cologne. The story of her poverty during these years is untrue. Consult Miss Pardoe, ‘Life and Memoirs of Marie de Medici’ (1852); Lord, ‘The Regency of Marie de Médicis’ (1903).

Marie Pauline, Princess Borghese. See BORGHESE, MARIE PAULINE.

Marienbad, mä-rē'ĕn-bäd, Austria, one of the most frequented and picturesque of the Bohemian watering-places, near the wesern frontier, in a kind of triangular basin formed by several mountain ranges, about 28 miles northwest of Pilsen. The village, built on a slope, surrounded with woods of pine and fir-trees, except in front, has a town-house with assembly-room and reading-rooms; several bathing establishments, theatre, etc. The springs utilized are eight in number and are cold; some are alkaline and containing Glauber's salts, others alkaline and chalybeate, etc. Seven are used externally and internally, one is used for bathing alone. Great quantities of the water are exported. Pop. about 5,000

Marietta, mă-rĭ-ĕt'ạ, Ga., city, county-seat of Cobb County; on the Nashville, Chattanooga & Saint Louis railroad; about 20 miles north by west of Atlanta. Kenesaw Mountain (q.v.) is west of the city. It was settled about 1840-1 and incorporated in 1852. A city charter was granted in 1885. It is in a fertile agricultural region in which stock-raising is one of the prominent occupations. Large marble quarries are in the vicinity. The chief manufactures are chairs, dressed marble, and machine-shop products. The chief buildings are the churches and schools. The Clarke Library, which contains about 5,500 volumes, is in Marietta. A National Cemetery located here contains the graves of 10,279 soldiers; the unknown dead number 2,967. The mayor and council are chosen at a popular election. Pop. (1910) 5,949.

Marietta was an intermediate objective point in Gen. Sherman's compaign for Atlanta, and when he crossed the Etowah 23 May 1864, his columns were headed for that place by way of Dallas and New Hope Church, but Gen. J. E. Johnston threw his army in his front and checked him at New Hope Church and Dallas. After many hard-fought battles and constant severe skirmishing, Johnston abandoned his Dallas lines (see DALLAS, GA., BATTLE LINES AT) on 4 June, and took position covering Marietta, his left on Lost Mountain, his right beyond the railroad and behind Noonday Creek, with a strong advanced position on Pine Mountain. Sherman repaired the railroad, established a secondary, fortified base at Allatoona Pass, and joined by Blair's Seventeenth corps, advanced 10 June and confronted Johnston in his new and strong position, and by the 14th was strongly intrenched before it in a continuous line of 10 miles. Johnston abandoned Pine Mountain on the night of the 14th, and Sherman advanced his lines, bringing on the engagement at Pine Mountain (q.v.) 15 June. The general movement was continued on the 16th and the right thrown forward to threaten the railroad below Marietta. On the 18th Johnston fell back to a new line, including Kenesaw Mountain, which was strongly fortified, and Sherman pressed in closely on the centre and left, north of Marietta,. still continuing the extension of his line to the right, south of it. Johnston, making a corresponding movement by his left, encountered Sherman's right at Kolb's Farm (q.v.) on the 22d. Sherman assaulted Kenesaw Mountain (q.v.) on the 27th, and was repulsed. Flanking operations were then renewed to the right to reach the railroad, and Johnston, finding it in danger and his communications with Atlanta threatened, after being 26 days under an uninterrupted cannonade and infantry fire, abandoned Marietta on the night of 2 July and fell back to a new line, previously selected and intrenched, ten miles south of Marietta, and covering the railroad and his pontoon-bridges across the Chattahoochee, with an advanced position at Smyrna Camp-ground. Sherman occupied Marietta on the morning of 3 July. The Union loss in the operations around Marietta was 1,790 killed and missing, and 5,740 wounded, an aggregate of 7,530. Johnston reported a Confederate loss of 468 killed and 3,480 wounded. Consult: ‘Official Records,’ Vol. XXXVIII.; Sherman, ‘Memoirs,’ Vol. II.; Van Horne, ‘History of the Army of the Cumberland,’ Vol. II.; Johnston, ‘Narrative.’

Marietta, Ohio, city, county-seat of Washington County; on the Ohio River at the mouth of the Muskingum, and on the Cleveland & M., the Toledo & O. C. Extension, the Baltimore & O. S. W., the Zanesville & O., and the Columbus N. R.R.'s; about 95 miles, in direct line, southeast of Columbus, the capital of the State. The first settlement was made in 1788 by people from New England, under Gen. Rufus Putnam, acting for the "Ohio Company" (q.v.) who had secured a grant of lands on both sides of the Muskingum River. The place was named in honor of Marie Antoinette. Arthur Saint Clair organized here July 1788 the Northwest Territory (q.v.). In 1800, Marietta was incorporated as a town. Fort Harmar, built in 1785, was opposite Marietta, and in 1890 the village of Harmar, once the site of the fort, was annexed to the city. The building used as the land office for the "Ohio Company" and an old church, the oldest in the State, are still standing here and in good condition. Many of the pioneers of New England as well as of Ohio, and many of the Revolutionary soldiers, were buried in the Marietta cemetery.

The city is in a coal, iron, petroleum, and gas region, with fertile agricultural lands in the valleys. Some of the manufacturing establishments are the chair factory, employing 650 persons; glassworks, employing 200; tool shops, with 150 employees; brick plant, 300 employees;

boat yards, 75; foundries, 300; other manufactories having in all fully 300 more employees. There are five banks with a combined capital of $500,000; the annual business amounts to over $3,000,000. The principal buildings are the Marietta College (q.v.), public and parish schools, the churches, and the county-buildings. The government is vested in a mayor and council and is administered according to the «Ohio Municipal Code.» The council is composed of six members, two of whom are elected each year. The site of Marietta was once part of a remarkable group of ancient works which consisted of two sections, one containing about 40 acres, the other about 20 acres. The remains of mounds, truncated pyramids, walks, walls, and other ancient works still exist, although the city covers a large part of the original enclosures. Remains of the walls, about five or six feet high by 20 or 30 feet base, may still be seen. Pop. (1900) 13,348; (1910) 12,923. Consult: King, 'History of Ohio'; Hoar, 'Oration at the Celebration of the Centennial of the Founding of the Northwest at Marietta.'

A. D. Alderman,
Editor of Marietta 'Register.'

Marietta College, in Marietta, Ohio, founded in 1835 for men and women. It has college and preparatory departments, the latter is known as Marietta Academy. The courses lead to the degrees of A.B., Ph.B., and B.L. Courses are provided for work in music, art, and military science, and short summer schools are given for work in the arts and sciences. The library, which has about 61,000 volumes and 30,000 pamphlets, is noted for its books on the history of the Northwest. In 1910 there were connected with the college 29 instructors and about 411 students. The grounds and buildings were valued at $251,000, the productive funds at $260,000, and the total income $34,000.

Mar'igold, a popular name for several unrelated plants. The pot marigold (*Calendula officinalis*) is one of the most widely popular of garden plants. It is grown for its brilliant flowers which range from white to rich orange, and for its flower-heads, which are often used to flavor soups, stews, and dressings. The African marigold (*Tagetes erecta*) and the French marigold (*T. patula*) are also widely used for ornament. Their flowers are usually some shade of yellow, but some are brown and some striped. The Cape marigold (*Dimorphotheca spp.*) are also grown for ornament but are less popular than the above. The corn-marigold (*Chrysanthemum segetum*) is a weed especially common in European grain-fields, but also cultivated for its flowers, for which the plant is sometimes forced in greenhouses. All these belong to the natural order *Compositæ*. The marsh marigold (*Caltha palustris*) is a member of the natural order *Ranunculaceæ*. It is a well-known plant in marshes and wet meadows. The leaves, gathered before flowering, are widely used as a potherb under the name of «cowslip greens.» The name fig marigold is applied to various members of the genus *Mesembryanthemum*, several of which are cultivated for their grotesque forms, their peculiar foliage, etc.

Marikina, măr-ĭ-kē'nạ, a Brazilian name for a marmoset (q.v.).

Marinduque, mä-rēn-doo'kā, Philippines, an island lying southwest of the province of Tayabas, Luzon; it is circular in shape, being 24 miles north and south and 23 miles east and west; area 667 square miles. A mountain range runs from north to south across the island, and near its centre are short spurs running east and west. The staple products are rice, cocoanuts and hemp; the island is heavily wooded, and fruits are abundant and an important article of food among the natives. The chief industry is the raising of rice, of which large quantities are exported, the hemp of Marinduque is of a peculiar fine quality, and is used for weaving. At the southern end of the island there is excellent pasturage, and horses and cattle are raised. It is in the route of steamers in the local trade between Manila and the Visayan Islands and Mindanao, and its two chief towns are ports of call for these steamers. In the winter of 1898–9 Marinduque was occupied by the United States troops, it being the first important position in the south taken after leaving Verde Passage. In 1901 it, with the small islands adjacent, was created a province under civil government; 23 June 1902 the provisions of the provincial government act were extended to the island of Mindoro and the Lubang group by incorporating them with the province of Marinduque. Pop. 48,000, mostly Tagálogs.

Marine Corps. See Navy of the United States.

Marine Hospital Service. See Hospital; Navy of The United States, The.

Marine Insects. Insects have not only invaded rivers and lakes, they have established themselves to some extent at least, along the margin of the sea. On a sunny day by the shore myriads of flies may be seen hovering over the seaweed cast up by the tide. These have been developed from grubs which live and feed in the decaying weed, and are able to bear immersion twice daily. Around the rock-pools many midges may be noticed. Their grubs feed on growing green seaweed, and spend their whole life in the salt water, breathing the dissolved air, as do their fresh-water relations, by means of gill-filaments, or simply through the surface of the skin. Many species of beetles inhabit the shore, and are submerged twice daily, when they lurk under stones or burrow into the sand; their hairy bodies are not easily wetted, and in one of the best known marine beetles (*Aëpus*) there are paired air-sacs in the hind-body which are believed to act as reservoirs for breathing while the tide is up. Several kinds of very small springtails may be seen on the surface of the rock-pools at low-tide; probably when the water rises they retire into crevices of the rocks. They are covered with a very fine, dense pile, and it seems impossible to wet them.

The absence of wings is a common character among the sea-shore insects. The beetles of the genus *Aëpus* are wingless, and so is the small bug *Aëpophilus* often found in their company, as well as the female of the midge *Clunio*, whose mate, though winged, appears not to fly, but to use his wings as sails as he skims over the surface of the rock-pools. «The tendency of insects on oceanic isles to lose their wings has often been noticed,» says Carpenter, «and the loss of the power of flight explained as an advantage since insects which do not fly cannot be blown out to sea. Possibly the absence of wings in so many sea-shore insects can be explained in like manner. Several genera of pond-skaters have one or two species which frequent the water of estuaries and harbors; these are in all cases wingless, though their fresh-water relations are, as a rule, winged.»

The extreme of adaptation to marine life is shown by the bugs of the genus *Halobates*, also belonging to the family *Hydrometridæ*, with their short anchor-like fore-legs and their immensely long and slender middle and hind-legs, the middle shin and foot being fringed with long hairs. The elongate wingless fore-body of these insects and the greatly reduced hind-body give them a most peculiar and characteristic appearance, and the dense pile wherewith they are clothed keeps them dry. They have been observed gliding over the calm seas of the tropics, often hundreds of miles from land, or clinging to drifting substances whence they could suck food. Consult G. H. Carpenter, ‘Insects, their Structure and Life’ (1899); Miall, ‘Natural History of Aquatic Insects’ (1895).

Marine Insurance. See INSURANCE, MARINE.

Marines, are troops enlisted for service either on board ship or on shore. They are drilled, disciplined, clothed, equipped, and paid similarly to the land forces. Their duties are to maintain the necessary guards, man some of the guns, form part of the armed crews of the various boats when called away for service, and form a permanent force for landing with the seamen if necessary. In all these matters they are commanded by their own officers. The marines of the European continental nations are not designed for service permanently on board ship; the American navy is the only one besides that of Great Britain in which the marine forms a necessary and definite fraction of a ship's company. United States marines, who are designated as the Marine Corps, distinguished themselves greatly in the operations in Cuban waters in 1898 and in those which led to the rescue of the foreign legations in Peking in 1900. The name marines is also used in the expression: «Tell that to the marines,» signifying utter disbelief in a statement made or story told; it arose from the fact that marines, being ignorant of seamanship, were made butts of by the sailors. See NAVY OF THE UNITED STATES.

Marinette, măr-ĭ-nĕt′, Wis., city, county-seat of Marinette County; at the mouth of the Menominee River, on Green Bay, and on the Chicago & N. W., the Wisconsin & M., and the Chicago, M. & St. P. R.R.'s; about 50 miles north by east of Green Bay and opposite Menominee, Mich. The harbor is large and safe, and the river affords opportunity for bringing logs from the forests along its upper course in both Wisconsin and Michigan. Marinette was settled about 1849–50 and in 1887 was incorporated. The water-power is extensive and the lumber industry of Marinette is most important. The large lumber mills are the chief manufacturing establishments of the city. Other industrial establishments are pail factories, paper and pulp mills, box and broom factories, gas and traction engine and iron works, threshing machine factories, furniture factories, and cabinet shops. The city carries on a lake commerce with all the important lake ports. The chief buildings are the city and county buildings, two hospitals, a public library, 20 churches, fine public and parish school buildings, and Our Lady of Lourdes' Institute. In the vicinity is large assembly ground where various religious and educational conventions are held each summer. Pop. (1890) 11,523; (1900) 16,195; (1910) 14,610.

Marini, Giambattista, jäm-bä-tēs′tā mä-rē′nē, Italian poet: b. Naples 18 Oct. 1569; d. there 25 March 1625. He was assisted by the Cardinal Pietro Aldobrandini at Rome, with whom he went to Turin, where he became secretary to the Duke of Savoy, Charles Emmanuel, but the envy of his enemies and his satirical humor involved him in various disputes. Marini's most famous work is the long epic ‘Adone’ (1623). His other works include ‘La Lira’ (1602–14); and a great collection of miscellaneous poems. Some of his sonnets are among the most perfect in the Italian language. He is the founder of the Marinist school of poetry, of which false, overstrained imagery, far-fetched metaphors, and forced conceits are characteristic features. Consult Menghini, ‘La vita e le opere di G. B. Marini’ (1888).

Marinoni, Hippolyte, ē-pō-lēt mä-rē-nō-nē, French inventor: b. Paris 1825. He has invented many appliances for printing which have been of world-wide adoption, among them are a rotary printing-press which turned out 40,000 copies an hour, another which printed in six colors 20,000 copies an hour, and at the Paris Exposition he exhibited a press which printed at a rapid rate two colors on each side of a sheet by one revolution.

Mario, Giuseppe, joo-sĕp′pĕ mä′rē-ō, MARQUIS DI CANDI, Italian tenor: b. Cagliari, Sardinia, 18 Oct. 1810; d. Rome 11 Dec. 1883. After serving in the Sardinian army he went to Paris, where after two years of musical study he was appointed first tenor of the opera, changing his name at the same time from De Candia to Mario. He made his debut 2 Dec. 1838 as Robert in ‘Robert the Devil,’ and soon became the leading tenor of the world. His répertoire embraced all the great works of Rossini, Bellini, Donizetti, and Verdi. He married the famous singer Giulia Grisi in 1854 and together they made an operatic tour of the United States. In his later years after his retirement from the stage in 1871 he lost his fortune through speculations, and the next year made a concert tour in this country.

Mariol′atry. See MARY.

Marion, măr′ĭ-ȯn, **Francis,** American soldier: b. near Georgetown, S. C., in 1732; d. Pond Bluff 27 Feb. 1795. He was the youngest in a family of six children. His grandfather, Benjamin Marion, was a Huguenot exiled from France in 1690. At 16 Francis showed his adventurous disposition by embarking on a small vessel bound for the West Indies. It was wrecked and he barely escaped death by starvation. He returned home and worked several years on a farm. In 1760–1 he served in campaigns against the Cherokees. Thenceforth until 1775 he lived on his plantation at Pond Bluff in the parish of St. John.

In 1775 Marion was elected member from St. John in the South Carolina Provincial Congress, which adopted the bill of rights and voted money for raising troops. He was chosen captain (21 June 1775) and took the field against the British and the Tories. He took part in the capture of Fort Johnson (14 Sept. 1775), and because of his ability in organizing and discipline was premoted to major. He participated in the patriot victory (28 June 1776) at Charleston, which gave the Southern States respite from active fighting for nearly three years. Appointed lieutenant-colonel, he led his regiment in the unsuccessful attack on Savannah (September 1779). In 1780 Marion, now a brigadier-general, was obliged to take refuge in forest and swamp. Beginning with a handful of men, less than 20, he gathered recruits, fearless riders and good marksmen, who formed the famed «Marion's brigade.» At times they numbered several hundred. They came and went at their leader's bidding, providing their own equipment and rations. Part of the time they were at work on their farms, planting crops. These rough and ready troopers became the terror of the British regulars and the Tories, although in justice to Marion's men it should be said that they committed no acts of wanton cruelty and burned no buildings on Tory homesteads. The stories of his adventures read more like fiction than history. His scouts kept close watch of the enemy's movements, and detachments of the brigade struck blow after blow, surprising and capturing small parties of soldiers. At times they united with larger bodies of troops for important engagements. After a vain pursuit, Tarleton named Marion the «Swamp Fox.» Failing in his attempt against Georgetown (December 1780), he retired to Swan Island and prepared for a second attack (13 Jan. 1781), which was also unsuccessful. Then he joined with Colonel Henry Lee in reducing Fort Watson (April 1781). After raiding 200 miles of country he commanded the first line in the battle of Eutaw Springs and took many prisoners. For his gallantry in this engagement he received the thanks of Congress. From 1782 to 1790 Marion served in the State Senate and was a member of the State Constitutional Convention in 1790. He opposed harsh treatment of the Tories and condemned the confiscation act of 1782. In 1784 he married a wealthy lady, Mary Videau, who survived him with no children. He was a man of attractive personality. Of slight figure, he was capable of great endurance and accustomed to abstinence. As a leader he was admired and beloved. He justly ranks among the heroes of the Revolution. Consult: Biography by Horry and Weems (1815), Simms, ‹Life of Francis Marion› (1844), Tarleton, ‹History of the Campaigns of 1780–1781› (1787).

Marion, Ala., town, county-seat of Perry County; on the Southern railroad; about 60 miles west by north from Montgomery. It is situated in a fertile agricultural region, and its industries are connected with the farm products. It is the seat of the Marion Female Seminary, established in 1836; the Judson Female Institute (Baptist), established in 1839; Lincoln Normal School for colored pupils (Congregationalist); and the Marion Military Institute. Pop. (1910) 1,834.

Marion, Ill., city, county-seat of Williamson County; on the Illinois Central railroad; about 150 miles south by east of Springfield. It is situated in an agricultural region in which are large deposits of coal and near which are extensive timber tracts. The chief industries which contribute to the support of the city are coal-mining, lumbering, fruit raising, manufacturing flour and raising cattle. Marion is the chief trade centre of a large portion of Williamson and adjoining counties. Pop. (1890) 1,338; (1900) 2,510; (1910) 7,093.

Marion, Ind., city, county-seat of Grant County; on the Mississinewa River, and on the Toledo, St. L. & K. C., the Cleveland, C., C. & St. L., the Cincinnati, R. & M., and the Pittsburg, C., C. & St L. R.R.'s; about 68 miles northeast of Indianapolis. It is situated in a fertile agricultural region and in a natural-gas belt, and the Mississinewa furnishes abundant water-power. The chief manufactures are flour, lumber, pulp, paper, brick, foundry products, window glass, bottles, glass jars, furniture, linseed oil, and rolling-mill products. The trade is extensive and is chiefly in its own manufactures and farm products. Some of the principal buildings are the public library, which cost $65,000, a large normal college, a court-house, and the churches and schools. Three miles south of the city is a National Soldiers' Home, which cost about $1,510,000. The electric-light plant and the waterworks are owned and operated by the city. Pop. (1910) 19,359.

Marion, Iowa, city, county-seat of Linn County; on the Chicago, Milwaukee & Saint Paul railroad; about 110 miles northeast of Des Moines. It was settled in 1839 and in 1852 was incorporated. It is situated in a rich agricultural region in which the chief products are corn, broom-corn, wheat, and vegetables. Considerable attention is given to stock-raising. Marion is the headquarters of a railroad division and has large railroad repair shops, freight yards, and a round-house. Other industrial establishments are broom factories, greenhouses, flour mills, a large creamery, and cigar factories. Pop. (1910) 4,400.

Marion, Kan., city, county-seat of Marion County; on the Cottonwood River, and on the Chicago, R. I. & P., and the Atchison, T. & S. F. R.R.'s; about 115 miles southwest of Topeka. It is situated in a fertile agricultural region in which considerable attention is given to stock-raising. The chief manufactures are flour and dairy products. Pop. (1890) 2,047; (1900) 1,824; (1910 est.) 2,000.

Marion, Ohio, city, county-seat of Marion County; on the Erie, the Cleveland, C., C. & St. L., the Columbus, H. V. & T., and the Pennsylvania R.R.'s; about 45 miles north of Columbus, the capital of the State.

Marion was settled in 1815 by people from Rhode Island, and was incorporated in 1820 and chartered as a city in 1890. It is situated in a fertile agricultural section; considerable limestone is in the vicinity. The number of employees engaged in the chief industries of the city are, in the steam-shovel works, 500 persons; the foundries, 300; the lime-kilns and quarries, 600; engines and threshers, 550; buggies, carriages, etc., 150; agricultural implements, 100; wood-pulleys, 50; silk-mills, 50; mattress factory, 20. There are 13 churches, public and parish schools, and a Home for Aged Women. The four banks have a combined capital of $850,000. The government is vested in a mayor and a council of seven members, chosen annually by popular election. The inhabitants are chiefly native born. Pop. (1910) 18,232.

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Editor of ‹Star.›

Marion, S. C., city, county-seat of Marion County; on the Carolina N., and the Atlantic C. L. R.R.'s; about 100 miles west of Columbus. It is surrounded by rich farm lands, the chief products of which are tobacco and cotton. It has large cotton mills, cottonseed-oil mills, lumber and flour mills, and foundries. It ships to the large markets considerable tobacco and cotton products. Pop. (1910) 3,844.

Marion, Va., town, county-seat of Smyth County; on the Marion & R. V., and the Norfolk & W. R.R.'s; about 140 miles southwest of Lynchburg. Marion was settled in 1832 and in 1871 was incorporated. The chief industrial establishments are flour and lumber mills and wooden-ware factories. Mining and quarrying in the vicinity contribute to the industrial wealth of the town. It is the seat of the Marion Female College (Lutheran) and the Southwestern State Hospital for the Insane. The water for drinking and domestic purposes is brought from springs in the hills about three miles distant, and the waterworks plant is owned and operated by the town. Pop. (1910) 2,727.

Mariotte, Edme, ĕd-mĕ mā-rē-ŏt, French physicist: d. 12 May 1684. He lived for the most part at Dijon, and was made prior of Saint-Martin-sous-Beaune. He became a member of the Academy of Sciences upon its formation, and was one of the founders of experimental physics. «It is Mariotte,» said Condorcet, «who first in France introduced into physics a spirit of observation and of doubt.» He discovered independently the law known by his name — also discovered by Robert Boyle (q.v.) and known as Boyle's law,— that if the temperature remain constant, the volume of a gas will vary inversely as the pressure.

Mariotte's Law, in physics, the principle that the volume of a gas, under ordinary conditions of temperature and pressure, is sensibly proportional to the reciprocal of the pressure, so long as the temperature remains constant. It is identical with Boyle's law, the latter name being applied to it in the United States and England, and the former in continental Europe. See *Boyle's Law* under GASES, GENERAL PROPERTIES OF, and GASES, KINETIC THEORY OF.

Mariposa Lily, or **Butterfly Lily,** popular names for various species of *Calochortus* of the order *Liliaceæ*. The numerous species, all of which are natives of western United States and British Columbia, are characterized by coated corms; rather leafy, generally branched stems; and showy, six-segmented flowers. Almost all the species are in cultivation for ornament, some, natives of the Colorado desert, being suited to arid conditions, others to fairly moist soils, still others to very cold localities, as species indigenous to the mountains of Sierra Nevada. All will stand extreme cold, but not alternate freezing and thawing, hence their failure under such conditions. The bulbs should be planted in late autumn in any kind of soil. After the tops have become yellow subsequent to flowering in the following year the bulbs should be taken up, divided and kept dry until planting time. They are often grown in pots under glass.

Maris, mä'rĭs, **Jakob,** Dutch painter: b. at The Hague 25 Aug. 1837. He early began his art studies at the local academy, choosing landscape as a specialty, and receiving instruction from Ströbel and Van Hove, which latter he followed on his removal to Antwerp. He studied also under Keyser, director of the Antwerp Academy. Going to Paris he came under the influence of the Barbizon school, and reached his full power as a painter of figures and landscape in combination. In 1871 he returned to his native town. His brush work and use of chiaroscuro are essentially French. Among his numerous works are, 'View of Schiedam'; 'View of a Town in Holland'; 'On the Sea Shore'; 'Mother and Children'.

Mariscal, Ignacio M., Mexican statesman: b. Oaxaca, 5 July 1829; d. Mexico City, 16 April 1910. He received his diploma as a lawyer in 1849, and practiced his profession until 1857, when he was elected a member of the federal congress. Two years later he was made justice of the supreme court of Oaxaca, and in 1860 circuit judge of the states of Oaxaca, Veracruz and Puebla. In 1861 he was again elected to the federal congress, being assigned the additional duties and responsibilities of government assessor of church properties; served as justice of the supreme court in 1862; as sub-secretary of foreign affairs in 1863, and was appointed first secretary of the Mexican legation at Washington in August of that year; chargé d'affaires 25 Oct. 1867, secretary of justice and public instruction in 1868; envoy extraordinary and minister plenipotentiary at Washington 1 June 1869; secretary of foreign affairs 10 March 1871; envoy extraordinary and minister plenipotentiary at Washington June 1872; justice of the supreme court of the Federal District and director of the national school of jurisprudence July 1879; secretary of foreign affairs 22 Nov. 1880; special envoy to Great Britain May 1883 and envoy extraordinary and minister plenipotentiary October 1884; secretary of foreign affairs June 1885, a position which he still retains. He is also a member of the Geographical and Statistical Society of Mexico. He was closely associated with President Juarez throughout the War of the Reform, was secretary and legal counsel to the Mexican legation at Washington during the War of Intervention, and was the author of several historical and other works. Mr. Mariscal received many decorations from foreign governments.

Marists, mā'rĭsts, term applied to two modern religious congregations in the Roman Catholic Church. The Marist Fathers, or Society of Fathers of Mary, originated in Lyons (1816), where a number of religious devoted themselves to missionary work, which extended over the Pacific islands and in 1845 passed on to Australia. The Marist Brothers, whose object was the education of youth, were founded a year later at Marseilles, and chose for its field of labor the south of France. The Marist Fathers have 156 members in the United States which they entered 1849. Their headquarters is at Brookland, D. C. They have schools at Manchester, N. H.; Lowell and Lawrence, Mass., and New York.

Maritime Law. See LAW, MARITIME.

Maritza, mā-rēt'sā, **Turkey,** a river, the ancient Hebrus, rising as the Topolnitza, near the Bulgarian frontier, in the Balkan Mountains, and flowing through Eastern Rumelia, southeast to Adrianople, where it bends to the southwest, and falls into the Ægean Sea by the Gulf of Enos. It is over 300 miles long, and navigable to Adrianople, about 100 miles from its mouth.

Marius, mā'rĭ-ŭs, **Gaius,** Roman general: b. 156 B.C., in Cereatæ, in the Volscian territory; d. Rome 86 B.C. He won his first military repute at Numantia in 134, beginning his rapid rise from the ranks; was made tribune of the people in 119; increased his political power by marrying Julius Cæsar's aunt; became prætor in 115; went to Spain in the next year, suppressing brigandage there; and in 109 accompanied Metellus to Africa. Two years later he was chosen consul, displaced his superior officer, and made a brilliant campaign. His success was so great that he was elected consul four times in succession (104–101 B.C.)—a proceeding counter to law and entirely unparalleled — so as to meet the invasion of Italy by the Cimbri and Teutones. He defeated the latter tribe at Aquæ Sextiæ in 102, and the Cimbri at the Raudian Fields in 101. In 100 he was again elected consul. He made the fatal mistake of plunging into party politics, allied himself with the most disreputable leaders of the popular party, and, in his envy of the rising fame of the patrician Sulla (q.v.), attempted to remove him from his command in the Jugurthine War. Civil war broke out in 88. Sulla was victorious. Marius fled to Africa, whence he returned to Italy on the successful rising in Rome under Cinna. The first great proscription followed and many of Marius' opponents were killed. Marius was elected consul for the seventh time for 86 B.C., but died soon after he entered upon the office. Consult Beesly, 'Marius and Sulla' (1878).

Marius, The Epicurean, a philosophical romance by Walter Pater, published in 1885. The book has but a shadowy plot. It is, as the subtitle declares, a record of the hero's «sensations and ideas,» a history of a spiritual journey. Marius is a young Roman noble, of the time of Marcus Aurelius. Like the philosophic emperor himself, he is the embodiment of the finer forces of his day; his temperament being at once a repository of the true Roman greatness of the past, and a prophecy of the Christian disposition of the New Rome. In his earliest manhood he goes to Rome, meets there the philosophic emperor, mingles in the highly colored life of the time, studies, observes, reflects. The book is a remarkable story of spiritual development, as well as of the strange, luxurious, decaying Rome of the 2d century of the Christian era.

Mariut, mă-rē-oot', **Lake,** Egypt. See MAREOTIS.

Marivaux, Pierre Carlet de Chamblain de, pē-ăr kär-lā dė shäṅ-blăṅ dė mä-rē-vō, French dramatist and novelist: b. Paris 4 Feb. 1688; d. there 12 Feb. 1763. Of his life practically nothing is known save that he became an Academician in 1742 or 1743. He wrote essays in periodical form, the 'Spectateur Français' having a hint of English influence in both matter and name. His novels, especially the unfinished 'Vie de Marianne' and 'Paysan parvenu,' were a protest against the literary morals of contemporary fiction. But he is best known for such plays as 'Les Jeux de l'Amour et du Hasard' (1730), 'Les Fausses Confidences' (1738), 'Le Legs' (1736), and 'La Mère confidente' (1735), which are marked by a total opposition to the style and manner of Molière, by much skill in intrigue and in portraying women, and by the peculiarly artificial and elaborate style, which takes its name «Marivaudage» from the author. Consult: Savollée, 'Marivaux inconnu' (1880); Fleury, 'Marivaux et le Marivaudage' (1881); Gossot, 'Marivaux Moraliste' (1881); Larroument, 'Marivaux, sa Vie et ses Œuvres' (1894); Deschamps, 'Maurivaux' (1897).

Mar'joram, a genus of annual or perennial herbs and a few shrubs (*Origanum*) of the natural order *Labiatæ*. The species of which there are about 25, are mostly natives of the Mediterranean region and southwestern Asia. They have several-flowered whorls of labiate flowers arranged in spikes. Two species are widely cultivated in gardens for culinary purposes, being used fresh, dried or in decoction for flavoring soups, stews, dressings, sauces and salads. Common or pot marjoram (*O. vulgare*) is a hardy perennial with pink or purple flowers and highly aromatic leaves. It succeeds best upon warm garden soils well exposed to the sun, and may be propagated by seeds, divisions, or cuttings. Sweet marjoram (*O. marjorana*) is also a perennial, but is tender and consequently treated as an annual, hence the popular name annual marjoram. It is usually raised from seeds sown in a hotbed or green-house and transplanted to ground like the above.

Mark, Saint, the Evangelist. See GOSPELS.

Mark Antony. See ANTONIUS, MARCUS.

Mark Twain. See CLEMENS, SAMUEL LANGHORNE.

Mark, an old English term for a money of account, and in some other countries for a coin. The English mark was valued at $3.33, and the Scotch mark, or merk, was $3.42. In the coinage of the German empire the mark is a coin of nearly the same value as the English shilling. A mark banco used to be a money of account in Hamburg equal to 37 cents, nearly. The mark was also used as a weight in several parts of Europe, being divided into 24 carats.

Mark, Order of Saint, a Venetian order of knighthood. The doge, as well as the senate, elected knights of Saint Mark, who enjoyed a pension. Foreigners also, particularly scholars, were elected. Saint Mark the Evangelist was the patron saint of the Venetian Republic.

Markham, märk'am, **Albert Hastings,** English admiral and Arctic explorer, cousin of Sir Clements Markham (q.v.): b. Bagnères, 11 Nov. 1841. He entered the navy in 1855, saw active service in the China Seas for several years, took part in the Polar expeditions of Adams (1873) and of Nares (1875), and in the latter expedition attained what was then the farthest north, 83° 20′ 26″. With Sir Henry Gorn-Booth he attempted to reach Franz Joseph Land in 1879, but was unsuccessful; in the next year Markham explored the Galapagos Islands. Rear-admiral in 1892 and second in command of the Mediterranean fleet in 1893, he is now a vice-admiral. He has written: 'The Cruise of the Rosario amongst the New Hebrides' (1873); 'The Great Frozen Sea' (1878); 'The Voyages and Works of John Davis' (1884); 'A Polar Reconnaissance' (1879); and 'Life of Sir John Franklin' (1891).

Markham, Sir Clements Robert, English geographer and traveler: b. Stillingfleet, near York, 20 July 1830. He was educated at Westminster School, entered the navy in 1844, accompanied the Franklin Search Expedition of 1850, and then retired from the service. He traveled in Peru in 1852–4 and 1860–1, the second journey being undertaken to get cinchona seeds for planting in India, an experiment described in his ‘Peruvian Bark; Cinchona Culture in British India, 1860–1880’ (1880). After spending 1865–6 in Ceylon and India, he became secretary of the India Office in 1867 and curator of its Geographical Department in 1868. In 1858 he had been appointed secretary of the Hakluyt Society, of which he became president in 1890. Since 1863 he was secretary of the Royal Geographical Society, and in 1893 became its president. His more important works, several of which were translated into German, are: ‘Cuzco and Lima’ (1856); ‘Travels in Peru and India’ (1862); ‘The Arctic Navy List’ (1875); ‘Life of John Davis’ (1889, in a series, ‘The World's Great Explorers’); ‘Major James Rennell’ (1895); ‘Richard Hakluyt’ (1896); and an English version of a Peruvian drama, ‘Ollanta’ (1871). He edited ‘The Geographical Magazine’ from 1872 to 1878 and was knighted in 1896.

Markham, Edwin, American poet: b. Oregon City, Ore., 23 April 1852. He spent his boyhood on a ranch in central California, herding cattle and sheep, and later graduated from the California State Normal School at San José and from Santa Rosa College. He studied law, but did not practise; subsequently took up educational work, and was superintendent and head master of schools in California, and principal of the Observation School of the University of California in Oakland. He had for some time been an occasional contributor to some of the leading American magazines, but first gained wide reputation through the publication of his poem, ‘The Man with the Hoe,’ suggested to him by Millet's picture of the same name. This first appeared in the San Francisco *Examiner* and was later published in a collection entitled ‘The Man with the Hoe and Other Poems’ (1899). This poem, which had a wide influence and caused much discussion, is intended by the author not merely as a picture of the peasant but as “a symbol of the toiler brutalized through long ages of industrial oppression.” His other publications include: ‘Lincoln and Other Poems’ (1901); and ‘Field Folk, Interpretations of Millet’ (1901).

Markham, Jared Clark, American architect: b. Tyringham, Mass., 18 Nov. 1816. He designed the battle monument at Saratoga and has published ‘Appeal to the American People in Behalf of National Monuments’ (1872); ‘Monumental Art’ (1884); ‘Historic Sculpture’ (1886).

Markham, William, English colonial governor in America: b. England about 1635; d. Philadelphia 12 June 1704. When William Penn obtained a charter for Pennsylvania, he made Markham, a first cousin of his, his deputy. Markham had all rights granted to Penn save that of convoking a legislative assembly. On 3 Aug. 1681 he established a council, later chose the site for Philadelphia, and conferred with Lord Baltimore as to the Maryland-Pennsylvania boundary. Penn himself arrived on 27 Oct. 1682, and Markham, whose commission accordingly lapsed, was elected to the council. In 1684–99 he was secretary to the province, in 1686 became land commissioner, and in 1689 an auditor of accounts. When in 1691 the territory now constituting the State of Delaware was detached from the province, he was appointed its deputy-governor, and in 1694–9, as lieutenant-governor, administered both this territory and the province.

Markhor, mär'kôr or -koor, a remarkable goat (*Capra falconeri*) of the mountains of Afghanistan and northwestern India, where it keeps among the highest wooded valleys, ascending and descending only as compelled to do so by the seasonal changes in the depth of the snow. It is of large size, standing about 3 feet tall at the shoulders, and is reddish brown in summer and light gray in winter. “The magnificent beard, extending in the adult males on to the chest and shoulders, and sometimes reaching nearly to the knees, is black in front and gray behind; in the young bucks and the does at all ages it is confined to the chin.” The horns are very different from those of other goats, rising straight up from the forehead, spreading sideways, so as to form a V when seen from in front, and spirally twisted. Specimens have measured 50 inches along the spiral keel. Several distinct local varieties of markhor are known to the Himalayan hunters, who regard this animal as one of the most excellent objects of sport in that region of prime game animals. “Unlike the ibex, which keeps to the rugged crags and steep ravines above the limits of the forest, the markhor delights in rocky forests, and although it occasionally comes out into the open glades, it seeks concealment as much as possible.” Hence its hunting calls for the greatest skill as well as endurance. This goat is often captured, tamed and crossed with domestic goats; and it is believed to have had some influence in originating the Angora breed. Consult: Lydekker, ‘Wild Oxen, Sheep and Goats of All Lands’ (1898).

Marking-nut, an East Indian tree (*Semecarpus Anacardium*) of the cashew family, having a fruit the receptacle of which is roasted and eaten. The black juice of the unripe fruit serves with quicklime to make an indelible marking-ink.

Markings of Animals. See Coloration, Protective.

Marks' Mills, Engagement at. On 23 April 1864, a train of 240 wagons, escorted by 1,200 infantry, 400 cavalry, and five guns, all under command of Lieut.-Col. F. M. Drake, 77th Ohio Infantry, left Camden, Ark., for Pine Bluff, to get supplies for Gen. Steele's army, then co-operating with Banks' Red River expedition. At 10 A.M. of the 25th, when at Marks' Mills, on the Camden and Pine Bluff road, about eight miles beyond Saline River, Drake was attacked front and rear, by Gen. Fagan's force of 3,000 men — cavalry, mounted infantry, and two batteries — and after a hard fight of more than three hours, during which Drake was severely wounded, and had lost 250 in killed and wounded, the entire train, guns, and the greater part of the cavalry and infantry were captured. About 300 escaped and made their way to Little Rock and Pine Bluff. Incomplete Confederate returns show a loss of 41 killed, 108 wounded, and 144 missing. Fagan's entire loss was about 420. When Steele heard of the disaster he immediately abandoned the idea of joining Banks, left Camden on the night of the 26th for Little Rock, was followed by Sterling Price, had a rear-guard fight at Jenkins' Ferry on the 30th, and continued his retreat to Little Rock. Consult: 'Official Records,' Vol. XXXIV.

E. A. CARMAN.

Marl, a mixture of carbonate of lime and clay in various proportions. If the lime predominate the marl is called calcareous; clay marl, or argillaceous marl, has a larger proportion of clay. As marl is hard or not it is called indurated or earthy. Even the more solid marls crumble soon on exposure to the atmosphere, and form a paste if dipped in water; they effervesce in acids, because of the presence of carbonate of lime. Marl occurs in masses and beds, is associated with chalk, gypsum, sand, clay, or compact limestone, and contains important fossil remains. To the presence of carbonate of lime in its composition, marl owes its use as a fertilizer. Hence it happens that many natural mixtures used as manures are called marls, such as the New Jersey green sand-marls, which contain as their principal constituents clay and greensand and usually only 1 or 2 per cent of carbonate of lime. The latter use of the word is scarcely justifiable, especially as it is sometimes applied, notably in England, to substances containing no lime at all.

Marlboro, märl'bŭr-ō, Mass., city, in Middlesex County; on the Boston & M. and the New York, N. H. & H. R.R.'s; about 28 miles west of Boston and 15 miles east of Worcester. Marlboro was settled in 1656 by a colony from Sudbury, Mass., and four years after was incorporated as a town. In 1890 it was chartered as a city. During King Philip's War (1676) the Indians destroyed nearly the whole town. The chief manufactures are boots and shoes, shoe-making machinery, automobiles and automobile-tires, bicycles, carriages and wagons, lamps, electrical machines and supplies, boxes, hose-pipe, wooden-ware, cigars, and machine-shop products. The principal buildings are the high school, city-hall, Saint Ann's Convent and Academy, a public library, G. A. R. building, and a number of churches and schools. The mayor is elected annually and has power to appoint, subject to approval by the council, the police and the members of the street and fire departments. He also appoints the members of the license department. The council elects the members of the health, poor, and water departments. The waterworks are owned and operated by the city. Pop. (1900) 13,607; (1910) 14,579. Consult Hudson, 'History of the Town of Marlboro, Massachusetts.'

Marlborough, märl'bŭr-ō, or mâl'bŭr-ō, **John Churchill**, DUKE OF, English general and statesman: b. Ashe, Devonshire, 1650; d. Blenheim 16 June 1722. At 12 he became page to the Duke of York (afterward James II.), by whom at 16 he was appointed an ensign. He was present at the siege of Tangiers, and soon after his return rose to the rank of captain. In 1672 he accompanied the Duke of Monmouth to assist Turenne against the Dutch. At the siege of Maestricht he distinguished himself so highly as to obtain the public thanks of the king of France. On his return to England he was made lieutenant-colonel, and his advancement was rapid. He had a regiment of dragoons presented to him, and strengthened his influence at court by his marriage with Sarah Jennings, an attendant upon the princess, afterward Queen Anne. In 1682 he obtained the title of Baron of Aymouth, and on the accession of James II. was sent ambassador to France, and soon after his return created Baron Churchill of Sandbridge, and raised to the rank of general. The same year he suppressed the rebellion of the Duke of Monmouth. On the arrival of the Prince of Orange he joined him at Axminster, and was rewarded by the earldom of Marlborough, and the appointment of commander-in-chief of the English army in the Low Countries. The following year he served in Ireland, where he reduced Cork, Kinsale, and other places. In 1691 he was suddenly dismissed from all his employments and committed to the Tower on the charge of high treason, but soon obtained his release; though it appears that the suspicions against him were not without foundation. On the death of Queen Mary he was made a privy-councillor, and appointed governor to the young Duke of Gloucester; and in 1701 was created by King William commander-in-chief of the English forces in Holland, and ambassador plenipotentiary to the States-General. On the accession of Queen Anne in 1702, he was created captain-general of all the forces at home and abroad, and sent plenipotentiary to The Hague. There he was also made captain-general by the States. In the campaign of the same year he drove the French out of Spanish Guelders, and took Liège and other towns, for which he was created Duke of Marlborough. In 1704 he stormed the French and Bavarian lines at Donauwörth, and in the same year, with Prince Eugene, gained the victory of Blenheim (13 August) over the French and Bavarians, headed by Marshal Tallard and the Elector of Bavaria. The nation testified its gratitude by voting him the manor of Woodstock and Blenheim Palace, one of the finest seats in the kingdom. In the campaign of 1707 his antagonist was the famous Duc de Vendôme, over whom he gained no advantage; and on his return he found that his popularity at court was on the decline. In 1708 with Prince Eugene, he gained the battle of Oudenarde. In 1709 he defeated Marshal Villars at Malplaquet (11 September) though at a cost ill repaid by the capture of Mons, and in 1710 with Prince Eugene gained another victory over Villars. During his absence a new ministry, hostile to himself, was chosen, and on his return his command was taken from him, and a prosecution commenced against him for applying the public money to private purposes. He went in disgust to the Low Countries in 1712, but returned a short time before the queen's death, and on the accession of George I. was reinstated in the supreme military command. Consult: Coxe, 'Memoirs of the Duke of Marlborough' (1847–8); Alison, 'Military Life of the Duke of Marlborough' (1879); Saintsbury, 'Marlborough' (1879).

Marlborough, **New Zealand, the north-eastern provincial district of South Island, bounded by the sea and the provincial district of Nelson. Its extreme length is 130 miles, breadth 60 miles; area, about 3,000,000 acres.**

The coast is deeply indented by bays and natural harbors, from which the hills rise abruptly, clothed with magnificent forests. The district is generally hilly or mountainous, with splendid scenery. The amount of arable land is restricted; in the south are the Wairau Plains, one of the finest sheep tracts in New Zealand. Blenheim, the capital, is connected by rail with the seaport of Picton on Queen Charlotte Sound. Pop. about 17,000.

Mar'lin, Texas, city, county-seat of Falls County; on the Houston & T. C. and the International & G. N. R.R.'s; about 150 miles northwest of Houston and 26 miles southeast of Waco. It is situated in an agricultural region in which cotton is the chief product. The industrial establishments include a large cottonseed-oil mill, several cotton gins, and a cotton compress. The trade is chiefly in cotton and live stock. Marlin has a hot-water artesian well, 3,350 feet in depth, with a temperature of 147° F. The waters possess medicinal properties which attract a large number of health seekers to the city. Some of the principal buildings are a central school building, fine hotels, sanatoriums, an opera house, and a court-house. Pop. (1910) 3,878.

Marlin, a sportsman's name for the godwit (q.v.).

Mar'ling Spike, or **Marline Spike,** an iron pin tapering to a point, and principally used by sailors to separate the strands of a rope in splicing or knotting. A large wooden pin used for the same purpose is called a *fid.*

Mar'litt, E. See John, Eugenie.

Marlowe, Christopher, English poet and dramatist: b. 1564; d. 1593. In 1583 he took the A.B. degree at Bene't College, Cambridge, and in 1587 the degree of M.A. Perhaps in the same year, the first part of his ‹Tamburlaine› was acted in London; and the rest of his life was spent in active connection with the theatres. His life seems to have been somewhat dissipated, and the daring of his theological opinions gave color to an accusation of atheism. In 1593 he was killed in a tavern broil and was buried at St. Nicholas, Deptford.

Numerous plays have been assigned to Marlowe, including a share in the three parts of ‹Henry VI.›; and he may very likely have had some part in others besides the following, which can with certainty be ascribed to him: ‹The Tragedy of Dido,› of uncertain date of acting, printed 1594; ‹Tamburlaine› (two parts), acted 1587–8, printed 1590; ‹Dr. Faustus,› acted 1588–9, printed 1594; ‹The Jew of Malta,› acted about 1590, printed 1594; ‹Edward II.,› acted 1591, printed 1594; ‹The Massacre of Paris,› acted after 1591, printed about 1595. His ‹Hero and Leander› was left incomplete at his death, and was finished by George Chapman and published in 1598. Marlowe's plays attained a sudden and great popularity, and his poetic reputation is testified to by numerous tributes from his contemporaries.

Marlowe's dramatic activity came at a time of great emotional stir and stress. In England the ideas and ideals of the Renaissance and the Reformation had finally gained the ascendency over those of the Middle Ages. The struggle with Spain, which was just ending in the destruction of the Armada, had brought a triumphant consciousness of national greatness. From this newly discovered England as well as from the newly discovered America and the re-discovered world of Greece and Rome, came countless incentives for multiform activities. In literature as in life opportunity seemed boundless, experiment and innovation easy, voyages of discovery sure of rich reward. The drama had already become in some measure an expression of this national activity, but it still awaited the services of great literary genius. After two generations of precarious struggle, the professional companies had become firmly established in the public theatres and it was already plain that the main development of the drama was henceforth to be popular and professional rather than scholarly and amateur. In comedy, indeed, the plays of Lyly and Peele had already supplied refinement and a literary flavor, but in the popular drama in the main and in tragedy in particular, there was neither refinement nor poetry.

Marlowe created English tragedy anew. He threw aside Senecan traditions and devoted himself to meeting the demands of the London theatres, but the prologue to his first play was a declaration of reform, announcing the adoption of blank verse, heroic themes, and «high astounding terms.» His themes were novel, and his treatment of them seems to have been dictated by a conception of tragedy, formed independently of his predecessors,—the heroic struggle of a great personality doomed to inevitable defeat. ‹Tamburlaine› is hardly a tragedy at all but rather a chronicle of the hero's greatness; but in ‹Dr. Faustus› and ‹The Jew of Malta,› heroes with ambitions as boundless and passionate as Tamburlaine's are overwhelmed in the end by the limitations that forever bound human aspiration.

These plays mark the formation of the Marlowean type of tragedy, often imitated and long influential in the English drama. A protagonist distinguished by great passions and many crimes absorbs the interest of a series of scenes, brutal and sensational, full of violent action, ranting declamation, bloodshed, and villainy affording opportunity for elaborate theatrical spectacles, and adorned by passages of profound intellectual suggestiveness and extraordinary beauty of diction and melody. ‹Edward II.,› the most mature of his plays, illustrates these characteristics and also testifies to his growing power both as a playwright and as a poet. The characterization is less melodramatic, more varied, and more human than in the earlier plays; the structure more coherent and organized; the style less bombastic, more even and more dramatic. Shakespeare, who clearly imitated Marlowe in ‹Richard III.› and produced ‹Richard II.› in divalry of ‹Edward II.,› did not in these two plays surely surpass his master.

Marlowe's faults and deficiencies are apparent, and they cannot all be credited to the immaturity and experimental nature of his art. The banalities that mar his noblest scenes, and the absurdities that appear in every phase of his work, theatrical, dramatic, or poetic, would doubtless have disappeared in the rapid development of dramatic art which the next 30 years witnessed. But there are no indications that, had Marlowe's life been prolonged, he would ever have excelled in humor or the individualization of character. His achievement is, nevertheless, among the most remarkable and enduring of the Elizabethan era. His poetry remains forever impressive with its fine impetuosity, its splendors of diction and melody. His tragedies, of immense influence on the theatre of his day, continue to rank among the greatest of English literature in their expression of passionate ambition and aspiration. He was the first great Englsh dramatist, and he prepared the way for Shakespeare.

Bibliography.— The best collected editions of his works are by Rev. Alexander Dyce, 1850, and 1870, and by A. H. Bullen, 1885 (3 vols.). His four tragedies are in one vol. of Mermaid Series of Old Dramatists with introduction by J. A. Symonds. For biography and criticism: A. W. Ward, 'History of Dramatic Literature' (vol. 1); F. G. Fleay, 'Biographical Chronicle of the Drama' (vol. 2); J. H. Ingram, 'Christopher Marlowe and His Associates'; O. Fischer, 'Zur Charakteristik der Dramen Marlowe's' (Munich). Marlowe's life has been the theme of two modern tragedies, R. H. Horne's 'The Death of Marlowe' (1870), and Miss Josephine Peabody's 'Marlowe' (1901).

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Marlowe, Julia (Mrs. Taber), American actress: b. (Sarah Frances Frost), Caldbeck, Cumberlandshire, England, 17 Aug. 1870. She came with her parents to the United States in 1875. In 1882 she joined the Juvenile Opera Company, which presented 'Pinafore,' 'The Chimes of Normandy,' and other light operas, in which she was known as Frances Brough. Subsequently she took a child's part in 'Rip Van Winkle.' She then retired, studied in New York for three years, and then made her metropolitan début as Parthenia in 'Ingomar.' Her later rôles include Viola in 'Twelfth Night'; Rosalind in 'As You Like It'; Highland Mary in 'For Bonnie Prince Charley' (1897); Barbara Frietchie in the play of that name by Clyde Fitch (1899); and Charlotte Durand in Cable's 'Cavelier' (1902). Other plays in which she has taken the title rôles are 'Colinet' and 'When Knighthood was in Flower.' During the seasons 1905–7 she and Mr. E. H. Sothern became joint stars in Shakespearian rôles. On 28 May 1894 she was married to Robert Taber, who had been her leading man in her first appearance in 'Romeo and Juliet' in 1888. They starred together for a season, but owing to a disagreement were later separated and in 1900 Mrs. Taber secured a divorce. Consult Strang, 'Famous Actresses of the Day in America' (Boston 1899); Browne and Austin, 'Who's Who on the Stage' (New York 1906).

Mar'maduke, John Sappington, American soldier: b. Saline County, Mo., 14 March 1833; d. Jefferson City, Mo., 28 Dec. 1887. He studied at Yale and Harvard and graduated from West Point in 1857, and served in the United States army in the West. At the outbreak of the Civil War he entered the service of the Confederate States and rose to the rank of major-general. In 1864 he was captured and was not released until after the close of the wâr, when he went abroad for a time, and on his return engaged in business and also in journalism. He was defeated for the governorship of Missouri in 1880, but in 1884 was elected and served until his death.

Mar'malade, a jellied or gelatinous preparation made from quinces, peaches, apricots, or oranges, and portions of their rinds, with a mixture of sugar and spice. It is made like the ordinary jams, poured out warm into pots or jars, and sold in commerce as a confection.

Marmier, Xavier, French author: b. Pontarlier, Doubs, 24 June 1809; d. Paris, 11 Oct. 1892. He engaged in journalism and later traveled extensively in Switzerland, Holland, Germany, Russia, Algeria, America, and the East. In 1835 he accompanied the scientific voyage of the *Research* to the Arctic regions and then acquired a wide knowledge of the Scandinavian and Finnish languages and customs. In 1839 he became professor of foreign literature at Rennes and in 1841 occupied a position under the Minister of Public Instruction. In 1846 he was appointed librarian at St. Geneviève in Paris and in 1870 was elected a member of the Academy. Among his publications are 'Histoire de l'Islande' (1838); 'Langue et Littérature Islandaises' (1838); 'Histoire de la littérature en Danemark et en Suède' (1839); 'Lettres sur la Russie, la Finlande et la Pologne' (1843); 'Du Rhin au Nil' (1846); 'Lettres sur l'Amérique' (1852); 'Voyage en Suisse' (1861); 'Voyages et Littérature' (1888); and the novels 'Les fiancés du Spitzberg' (1858); 'Gazida' (1860); 'Cimarosa' (1867); 'Les drames du cœur' (1868); 'Une grande dame russe' (1876); etc.

Marmol, Jose, hō-sā' mär-mōl', Argentine author: b. Buenos Ayres 5 Dec. 1818; d. there 12 Aug. 1871. He was a pronounced Democrat, was banished by Rosas, led the opposition against that dictator, and on its successful termination became senator and librarian of Buenos Ayres. A fervent orator Marmol is better known as the author of 'La Amalia' (1866), a historical novel dealing with Rosas' dictatorship, of the popular patriotic poem 'El 25 de Mayo de 1843,' and of various dramas.

Marmont, Auguste Frederic Louis Viesse de, ō-gust frä-dē-rēk, loo-ē vē-ēs dē mär-môñ, Duke of Ragusa and Marshal of France: b. Chatillon-sur-Seine, France, 20 July 1774: d. Venice 2 March 1852. He entered the army as a lieutenant of infantry in his 15th year. In 1792 he changed to the artillery, and at Toulon became acquainted with Bonaparte, who chose him for his aide-de-camp. In the campaign of 1813 he held the command of an army corps in Germany, and fought in the battles of Lutzen, Bautzen, and Dresden. In 1814 he fought a final battle under the walls of Paris, but opposition appearing fruitless surrendered to the allies. This proceeding was one main cause of Napoleon's immediate abdication, and brought Marmont into favor with the Bourbons. After the Restoration Louis XVIII. made him a peer of France, but he was compelled to withdraw from Paris by the revolution of 1830, and his name was struck off the army list.

Marmontel, Jean Francois, zhŏn frän-swä mär-môñ-tĕl, French writer: b. Bort, Limousin, France, 11 July 1723; d. Abbeville, Eure, 31 Dec. 1799. He was educated for the Church, but turned to letters, and became a journalist and dramatist at Paris. In 1758–9 he edited 'Le Mercure,' and in 1763 was elected to the Academy. He wrote tragedies, including 'Denys le Tyran' (1748) and 'Aristomène' (1749); 'Contes moraux' (1761); and the works of fiction, 'Béhsavie' (1767) and 'Les Incas' (1778). His 'Poétique Française' (1763) and 'Eléments de Littérature' (1787) have perhaps a more permanent worth. A collected edition of his writings appeared in 1786–7.

Marmora, mär'mō-rạ, or **Marmara, Sea of** (anciently *Propontis*), an inland sea, lying between southeastern Europe and the westernmost part of Asia, communicating with the Mediterranean by the narrow strait called the Dardanelles, and with the Black Sea by the Bosporus. Length from Gallipoli to the head of the Gulf of Izmid, 177 miles; greatest breadth, which is near the centre, rather more than 50 miles; average depth, over 600 feet; maximum depth, 4,000 feet. The gulfs of Izmid and Moudania, on the Asiatic side, are the chief indentations. The largest of several islands is Marmora, famous for its quarries of marble and alabaster, situated near its western end; at the eastern end, on the Asiatic coast, and not far from Constantinople, is a group called the Princes Islands. A current sets from the Black Sea into the Sea of Marmora, which in turn runs into the Archipelago. The tides are hardly perceptible, and the navigation is easy.

Mar'moset, a small American monkey of the family *Hapalidæ*. They inhabit the Brazilian forests, possess long, non-prehensile tails, have a thick wooly fur, and bear a close resemblance to squirrels in appearance and movements, having long hind legs and penciled ears. They are notable, further, for the relatively large size of the brain and the few teeth (32), likening the family more to the monkeys of the Old World than to those of the other American family (*Cebidæ*). They are favorite pets, not only on account of their quaint prettiness, but because of their gentleness and intelligence; but they are exceedingly delicate and rarely survive a change of climate. Their food is varied.

The family includes many species which fall into two divisions — the genus *Hapale* and the genus *Midas*. The former contains the typical marmosets, or ouistitis, as the French call them, of which one species (*H. jacchus*) has long been a familiar pet; and the latter, the silky marmosets or tamarins, which are larger and more varied in their colors and in their ornamental tufts and crests. The best known species is the marikina (*M. rosalia*).

Mar'mot, a large ground-squirrel of the genus *Arctomys*, having terrestrial habits, rather coarse fur, no cheek-pouches, short limbs, and powerful digging claws. In size they vary from about 15 to 25 inches in length, the tail adding from 3 to 12 inches. Several species inhabit the northern parts of the world, in southerly climates, keeping themselves mostly upon mountain heights, but farther north inhabiting lower levels, preferring open or thinly wooded plains. All dig and dwell in burrows, some species gathering into extensive colonies, the hillocks about the mouths of the burrows forming communities similar to the "towns" of the prairie-dogs; while other species dwell in families far apart from one another. They feed upon herbage and grow very fat in the autumn preparatory to hibernation during the cold months, when their dormancy is complete. Their underground sleeping-chambers are warmly furnished with dry leaves and hay.

The European marmot (*A. Alpinus*) is found in plenty on the Alpine range, equals a rabbit in size, and is light brown in color. It lives immediately below the snow line, and subsists on vegetables, insects, and roots. They come forth from their burrows during the month of April, and are said to be readily tamed. The bobac, another European species (*A. bobac*), inhabits Poland, Russia and all nothern Asia. A third species is found in the Himalayan ranges; and a fourth (*A. caudatus*), the largest and handsomest of the family, dwells in the valleys of their southerly slopes. These little animals are of great value to the wandering natives of northern and central Asia, who utilize both their skins and flesh. America has two marmots, one of which is the siffleur or whistler of the tops of the northern Rocky Mountains, and the other the familiar eastern woodchuck. The former takes its name from the loud eerie whistle with which it wakes the echoes of the crags about the lone pastures above timber-line, where it makes its home; it was of great service to the mountain Indians. Other species or varieties occur in the southern mountains of the Western States.

The woodchuck, or ground-hog (*A. monax*), is a heavy, broad-headed, grizzled animal of the woods and fields, yellowish to whitish gray in color, blackish on the back and crown, and chestnut on the belly; with the feet and tail brownish black. It abounds throughout the whole country east of the dry plains, and flourishes in spite of civilization, as the farmers' meadows and gardens supply it with an increased supply of good food, and mankind thins out its worst enemies, such as wildcats, foxes, weasels, the larger serpents and birds of prey; none of these save the first is much to be feared by the full-grown woodchucks, but may kill many of the young. As a result the animals have become unpleasantly numerous in some districts of the Eastern States, where their depredations upon gardens and certain plantations, as of lettuce and celery, are often serious. Consult: Lydekker, 'Royal Natural History,' Vol. III. (1895); Stone and Cram, 'American Animals' (1902).

Marne, mărn, France, a river, the chief affluent of the Seine, rising in the plateau of Langres, flowing northwest past Châlons to Epernay, thence westward, joining the Seine at Charenton, four miles above Paris. Its length is 326 miles, 126 of which are navigable to Saint Dizier. It is connected by canals with the Rhine, the Aisne, and the Seine.

Marocco, mạ-rŏk'ō. See Morocco.

Maronites, măr'ō-nīts, a sect of eastern Christians, whose origin was a consequence of the Monothelite controversy. In the 7th century the opinion that Christ, though he united in himself the divine and human natures, had but one will arose among the eastern nations. But when their last patron, the Emperor Philippicus Bardanes, was deposed and exiled in 713, the

Monothelites were condemned and banished by his successor, Anastasius. The remnant of this party survived in the Maronites (so named from their founder Maron) — a society of monks in Syria, about Mount Lebanon, which is mentioned as early as the 6th century. Another monk, John Maro, or Marum, also preached Monothelitism there in the 7th century. Regarded as rebels by the Melchites (q.v.), or Christians who adhered to the opinions of the emperor, they became, in the country of Lebanon, which is now called Kesrawan, a warlike mountain people, who defended their political as well as their religious independence boldly against the Mohammedans, and who even now, under the Turkish government, resist the payment of a tribute, like the Druses. The political constitution of the Maronites is that of a military commonwealth. Governed by their ancient customary rights, defended from external attacks, they support themselves among the mountains by husbandry and the produce of their vineyards and mulberry-trees. The revenues of all their orders of ecclesiastics are very small, but a common spirit unites them, and in simplicity of manners, temperance, and hospitality, they resemble the ancient Arabians. Revenge for murder is permitted among them, and as a sign of nobility they wear the green turban. Their church constitution resembles very much that of the old Greek Church. Since the 12th century they have several times submitted to the Pope, and joined the Roman Catholic Church, without giving up their own peculiarities. At last Clement XII. induced them to accept the decrees of the Council of Trent at a synod held in 1736 at their convent of Marhanna. After this synod their priests still retained the right to marry, after the manner of the Greek Church; and they continued to administer the sacrament under both forms. The use of the Arabic language was preserved in the church service. Mass was read only in the ancient Syriac. Their head is called the Patriarch of Antioch, although his residence is in the monastery of Kanobin, upon Mount Lebanon; and he gives an account every 10 years to the Pope of the condition of the Maronite Church. Under him are the bishops and other clergymen, who form seven degrees of rank. In Kesrawan are over 200 Maronite convents and nunneries, containing in all from 20,000 to 25,000 members who profess the rule of St. Anthony, and devote themselves to agriculture and gardening. Since 1584 there has been a Maronite college established at Rome for the education and training of their clergy. At present the Maronites are supposed to number about 350,000, and these are distributed into 150 parishes. In consequence of the sanguinary conflicts between the Maronites and Druses, June 1860, both communities are now subject to one governor appointed by the Porte, with the title of governor of the Lebanon. See Druses.

Maroons', the name given to runaway negro slaves in Jamaica and in some parts of South America. The name seems to be equivalent to mountaineers, being derived from Spanish, *cimarron*, a fugitive negro or maroon, from *cima* (same as French *cime*), a summit or hilltop. In many cases runaway negroes, taking to the forests and mountains, rendered themselves formidable to the colonists, and sustained a long and brave resistance against the whites. When Jamaica was conquered by the English in 1655 about 1,500 slaves retreated to the mountains. They continued to harass the island till 1795, when they were finally reduced by the aid of bloodhounds. Some of them were removed to Nova Scotia, and afterward to Sierra Leone. Consult: Dallas, ‘History of the Maroons.’

Maroquin, măr-ō-kēn'. See Morocco (leather).

Marozia, mạ-rō'zĭ-ạ, Roman lady of infamous reputation, known for her influence at the Papal court: d. Rome 938 A.D. She was the daughter of Theodora (q.v.). According to Luitprand she was the mistress of Pope Sergius, but this is now denied as lacking historical foundation. As mother of John XI., and grandmother of John XII. and Leo VII., she exercised great influence on the political affairs of her time in Italy. She repented and died in a convent.

Marquand, mär-kănd', **Henry Gurdon**, American banker and philanthropist: b. New York city 11 April 1819; d. 26 Feb. 1902. He was educated in Pittsfield, Mass., and for 20 years was in the real estate business, afterward becoming a banker and acquiring an interest in various railways and other commercial enterprises. He was a generous patron of the Metropolitan Museum of Art, to which he gave valuable paintings, etc., and among his other benefactions are a pavilion to Bellevue Hospital and a gymnasium and a chapel to Princeton University.

Marque, märk, **Letter of**, a commission granted to the commander of a merchant ship or privateer to cruise against and make prizes of the enemy's ships and vessels, either at sea or in their harbors, under pretense of making reprisals for injuries received. The ship so commissioned is also called a letter of marque or mart. These letters are grantable by the law of nations, but the sovereign power must be called in to determine when reprisals may be made.

Marquesas, mär-kā'säs, or **Mendaña** (mĕn-dă'ña), **Islands**, or **Les Marquises**, Polynesia, an island group in the South Pacific Ocean, lat. 8° to 11° S.; lon. 138° 30' to 143° W. belonging to France since 1842, and composed of 12 islands and islets divided into two groups, the northern and southern. The largest islands are Nukahiva and Hiva-oa. The coasts are generally inaccessible, rising from the water like walls; but in Nukahiva there are some excellent natural harbors. The islands are generally high, some of their mountains reaching an elevation of over 4,000 feet; the intervening valleys are fertile, picturesque, and copiously watered by streams which form numerous cascades. The principal food productions are pulse, yams, cocoanuts, sugar-cane, cotton, and bamboos; hogs also are numerous. The men are well-formed, active, powerful, and all tattooed. The women have regular features, good complexions, fine teeth, and neat hands, and are the finest of the sex to be met with in Polynesia. The people of these islands were formerly cannibals, and though this practice has been discontinued cruelty and ferocity are prevailing characteristics, and the efforts of the missionaries have met with but little success. The Marquesas were discovered in 1595 by Alonza Mendaña de Neyva. They were subsequently visited and described by Cook and the Forsters in 1774, when Hood's Island was added to the group. In 1797 three more were discovered by Ingraham, an American captain, and were named Washington Islands. In 1842 they acknowledged the sovereignty of France. The population steadily decreased during the 19th century, in 1876 being 5,420, in 1910, 4,000.

Marquetry, mär'ket-rĭ (French, *marqueterie*), inlaid cabinet-work in which thin slices of different colored wood, sometimes of ivory, pearl, shell, or metal, are inlaid on a ground usually of oak or fir, well seasoned to prevent warping. The marquetry of Italy possesses much artistic merit. See INLAYING; MOSAIC.

Marquette, Jacques, French Jesuit missionary and explorer: b. Laon, France, 1 June 1637; d. near site of the present Ludington, Mich., 18 May 1675. His recent biographers, M. Alfred Hamy, in 'The Mississippi,' and the Rev. Samuel Hedges, in his book on the burial place of Marquette, tell us that his family was of good social position in his native city. It is evident that he must have had the advantages of early education, as he entered the Jesuit College at Nancy, in 1654, with the intention of joining the Society. He studied and taught, as Jesuit scholastics usually do, at Pont-à-Mouson, Rheims, Charleville, and Langres. In 1666 he was to go as a missionary priest to New France. He arrived at Quebec, 20 Sept. 1666. In the next month, he began his preparation for life among the savages by the study of the Indian languages, at Three Rivers, under the direction of Father Druillettes, who knew all the ways of missionary life. He spent two years in the wilderness, with Father Druillette's log house as his «home,» learning the forest and lake and living, as near as possible, the like of the Redmen. In 1668, Father Marquette was ready to begin work among the Ottawas. From Montreal, he went to Sault Ste. Marie, known to-day as the «Soo,» then marked in French records «Sanda Maria» of the Algonquins. The term «Ottawa,» as used by the Jesuits, included the Sioux, the Miamis, the Sacs, the Winnebagoes, Foxes, Pottawatomies, Chippewas, Beavers, Creeks, Ottawas, Hurons, Menominees, Illinois, and Hurons. From Sault Ste. Marie, he was sent to La Pointe Mission in Lake Superior. The place selected for his work was at Chequamegon Bay. From 14 Sept. 1669, until 1671, when the mission was given up because of the inability of the Hurons to defend themselves against the Sioux, he served and learned much. Father Marquette probably did not foresee that this abandonment meant that there would be no Christian mission on Lake Superior «for over a hundred years»; as the Rev. Samuel Hedges remarks, «There can be little doubt that the Blackrobe sat in their council circle, and took part in their deliberations, which determined their flight.» He says Marquette joined the Hurons in their rush to the South toward the Island of Mackinac, then Machillimackinac. The little town of St. Ignace, named in honor of the founder of the Jesuits, St. Ignatius Loyola, on Moran Bay,— claims the honor of being the spot where Father Marquette built his chapel in 1671. Mackinac Island disputes with St. Ignace the right of precedure, but there can be no doubt, whether a previous mission existed in Mackinac Island or not, that it was from St. Ignace Father Marquette set out in his search for the Mississippi,— of the existence of which traditions and rumors lived among the tribes.

The quarrels that had deflected the course of Sieur René de la Salle did not, in the end, prevent him from tracing the course of the Mississippi to the sea, and De Soto, earlier, had crossed the valley near its mouth, but it was Marquette who, having equipped himself with the Indian lore added to such scientific knowledge as he could acquire, actually discovered the wonderful stream of the Indian legends. Count Frontenac was the devoted friend of La Salle, but he could not overcome the jealousies raised by the clashing of commercial interests. It has been the fashion to accuse the Jesuits of merely mercenary motives in opposing the opening of the territory of their missions in New France to all trappers and traders. It is plain, human,— putting aside all imputed motives,— that Jesuits like Jogues, Albourg, Druillettes, and a hundred others did not lead lives of unspeakable deprivations and amazing self-sacrifice merely for temporal gain for their Society or their country. When it is known that they were French, it is at once known that they were patriots. And if the Jesuits opposed the mercantile designs of the supporter of La Salle, it must be admitted in the light of after events, that they were safeguarding the interests of their charges. The fate of Jogues and of René Goupil did not deter men like Marquette. It only made them more anxious to teach Christianity or to die. Marquette, like all the missionary priests of his Society, held that it was his duty to contribute to the knowledge of the world. Whether it was the analysis of a dialect or the bending of a river, the Jesuit made each his duty, always remembering the motto of his Society, «To the greater glory of God.» Marquette had kept in mind all the talk about the great river and the natives that dwelt upon its banks. He was sent, he believed, as one who must teach all nations, and he did not disdain any knowledge that might help him to this, valuing the knowledge itself, for every Jesuit was a student both of nature and of books. «In fishing and boating about the straits,» the Rev. Samuel Hedges writes, «the writer has often been puzzled by what he took for currents from Lake Michigan, as it empties into Lake Huron. But observation and experience showed him that the currents, as he thought them, as often tended toward Lake Michigan as from it. Marquette had noticed this long ago, and in one of his reports to his superiors offers an explanation. Louis Joliet had started to become a Jesuit, but had, instead, become a fur trader. When he was commissioned by the Governor of New France, to look for the great stream that, it was rumored, opened into the Pacific, Father Marquette, who earnestly desired it, was sent by his superiors to accompany him. On 8 Dec. 1672 Joliet reached St. Ignace under his own authorization from De Frontenac and one from Father Marquette's provincial, to claim for God and the king all the land and water they could find.

When the ice broke, on 17 May 1673, Marquette and Joliet set forth. Father Pierson took Father Marquette's place at the mission. Father

Marquette was something of a surveyor, and his maps are yet in evidence and very valuable. Two birch canoes that could only hug the shore and not dare the open lakes, and seven men,— five *voyageurs* — made up the expedition. Their stores were barely sufficient, their scientific instruments were, as one can easily imagine, inadequate. They were hopeful, hardy, and they knew every mood of the treacherous lakes and the meanings of all the changes in the weather. Marquette had acquired the quick eye and ear of the Indian, and his mind was supple and well-trained; Joliet was not far behind him in wood and water craft. Still, they followed dim rumors. The most interesting of Marquette's reports is that of the second halt at the Indian village of Mascouten, on Lake Winnebago. They had reached the «jumping off» place. Their first halt was at De Pere, the Mission St. Francis Xavier, to which Father Marquette had been recently assigned. They reached Lake Winnebago by way of the Fox River. From Green Bay,— the Mission St. Francis,— they went to Lake Winnebago, and, from thence, accompanied by the Indian guides, they ascended the upper Fox River and entered the Wisconsin, on 10 June 1673. After seven days of hard paddling, they entered the Mississippi on 17 June. The report of this expedition on which we must rely for information is Marquette's,— Joliet's having been lost in the upsetting of his canoe at the La Chine Rapids, near Montreal. It is included in the 'Jesuit Relations,' and quoted by John Gilmary Shea, Sparks, Parkman, Thwaites, Hedges, and all who have written of the early days of the Northwest. Dr. Shea, in his 'Discovery and Exploration of the Mississippi Valley,' estimates the distance traveled by Marquette and Joliet from St. Ignace to Green Bay (Mission St. Francis Xavier), at 218 miles. General Wood, Inspector-General United States Army, makes the whole distance traveled 2,549 miles, but he omits the distance from St. Ignace to Green Bay. Marquette and Joliet explored the Mississippi for 300 miles in solitude. Marquette describes the river at its junction with the Missouri as turbulent in the extreme. Marquette was pleased by the treatment received at the first village of Illinois Indians. They met Indians who showed traces of civilization; they were tormented with mosquitoes and they saw traces of iron. At the mouth of the Arkansas, they met with great kindness from the Indians. From the Illinois,— believing the route to be shorter,— they went, it is asserted, to a point near Chicago. By portage, at Sturgeon Bay, they saved time and strength, and from the Green Bay into the Fox River, they reached the Mission St. Francis,— having spent, from the beginning of their ascent of the newly discovered river, on 17 July, about two months,— four months, in all, of almost incessant hardship since they began their voyage on 17 May 1673. Further journeying was out of the question. Marquette and Joliet had not much strength left. A journey of nearly 3,000 miles, in birch canoes, had told on them, hardy as they were. Marquette spent 13 months at De Pere, endeavoring to regain his health. He knew well the stupendous importance of what he had done for France and for the world; but his business was with souls. While Joliet went to Montreal to report, Marquette started to found a new mission in Illinois. He left the Mission St. Francis on 25 Oct. 1674, with 10 canoes; he arrived at the Chicago River 4 December. The description of the carrying of the canoes through the forests gives a glimpse of the difficulties the missionary expected to encounter. The inundations of 30 March 1675 destroyed their hovel. At Haskasian Marquette's heart was filled with gratitude by the kindness he received. His desire for exploration led him, while using his strength in ministering to the Indians, to explore Lake Michigan farther. He grew weaker, and turned to the North. Through the river,— now Pere Marquette,— he made his homeward way. On Saturday, 18 May 1675, he died. The Ottawas,— under that name were included the tribes under the Jesuits in the Lake regions,— had among them several Hiskakons, to whom Marquette had been much devoted. These, going northward in the spring, raised his body, reverently prepared it according to the mode of their tribe, took it to the Mission St. Ignace, where Fathers Nource and Piersin awaited it. On Tuesday, 9 June 1676, Marquette was buried in the centre of the chapel of St. Ignace, a building which was destroyed by fire in 1706. In September 1877, Father Edward Jacker, pastor of St. Ignace, discovered the grave and remains of the great and good explorer, and they rest under a monument erected by the citizens of St. Ignace in 1882.

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Marquette, mär-kĕt', Mich., city, county-seat of Marquette County; on Lake Superior, and on the Duluth, S. S. & A., and the Lake Superior & I. R.R.'s; about 58 miles north by west of Escanaba, on Lake Michigan. The first permanent settlement was made in 1899 after public accounts had been given of the mineral wealth of the Upper Peninsula. It was incorporated in 1851 and chartered as a city in 1869. It was named after Père Marquette (q.v.) who had visited this section as a missionary to the Indians. It has a fine harbor with a breakwater 3,000 feet in length, and the best of facilities for loading steamers with the minerals, especially iron ore, which are shipped from here in large quantities. The ore docks are the largest and best fitted of any in the country. It has steamer communication with all the important lake ports. Near the city are large quarries of brownstone which furnish employment to a number of people. The chief industrial establishments are a planing-mill, two blast furnaces, steam-engine works, and the stone quarries, all employing about 800 men. Other smaller industries are the manufacturing of furniture, sash, door, and blinds, and bricks. The principal buildings are a government building which cost $150,000, a county court-house, cost $250,000; Peter White Library, the building cost $75,000, and the 15,000 volumes are valued at $30,000; a city hall, cost $60,000. The educational buildings are a State Normal School, which cost $150,000, eight public schools, cost $500,000, a manual training school, and Saint Joseph's Academy. It has Protestant Episcopal and Roman Catholic cathedrals, Saint Mary's Hospital, the Upper Peninsula State Prison, and a House of Correction. The Federal Government presented to the city Presque Isle, about 400 acres, a short distance north of the city proper. The place has been improved and made into a beautiful park. A statue of Père Marquette is in a city square, near the shore. The three banks have a combined capital of $400,000, and the annual business amounts to $7,500,000. The government is vested in a mayor and a council of 16 members who are elected annually. The electric-light plant and waterworks are owned and operated by the city. Pop. (1890) 9,093; (1900) 10,058; (1910) 11,503.

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Marquez, José Arnaldo, hō-sā' är-näl'dō mär-kāth, Peruvian poet: b. Peru about 1825; d. Lima 15 Jan. 1881. For participation in civil wars he was several times banished in the earlier part of his career and he lived variously in Chile, Cuba, and the United States. Among modern Peruvian poets Marquez takes high rank. He published: 'Lost Notes' (1862); 'Flor de Abel,' etc., and in prose 'El Peru y la Espana moderna'; and 'Recuerdos de un viage á los Estados Unidos de America.' He lost his life in the defense of Lima against the Chileans.

Marquez, Leonardo, Mexican soldier: b. Mexico about 1820. In 1849 he appeared as the leader of a movement in support of Santa Anna, and under Santa Anna's last administration he had important posts in the army (1853-5). He fought against Juarez in the «Reform» war, and favored the establishment of Maximilian's empire. In October 1866 Maximilian made him a division commander, and in March 1867 sent him to Mexico City to form a cabinet and raise troops for the relief of Querétaro. But he was hemmed in by Diaz, and after Maximilian's execution, resigned and went to Havana. He was frequently called «the tiger of Tacubaya,» from his execution there of a large number of prisoners (11 April 1859); though he alleged the express order of Miramon as an explanation. He was exempted from the amnesty of 1870.

Marquis, mär'kwĭs, or **Marquess** (Italian, *marchese;* French, *marquis;* German, *markgraf*), a title of honor next in dignity to that of duke. Marquises were not known in England till King Richard II., in the year 1385, created his great favorite Robert Vere, the earl of Oxford, Marquis of Dublin. In 1397 the same king raised John de Beaufort, earl of Somerset, to the rank of marquis, a dignity which he afterward refused to bear from its being an innovation. The title fell into disuse until the reign of Edward VI., who created the Marquisate of Winchester in 1551. The title given a marquis in the style of the heralds is *most noble and potent prince.*

Marrakesh. See Morocco.

Marriage, a solemn contract between a man and woman, by which they are united for life, and assume the legal relation of husband and wife. It has existed in all ages and probably in all nations, though with very different degrees of strictness. It is not the invention of legislators, but arose from the instincts and necessities of society, and its continuance has been provided for by the dictates of experience. Different localities have different forms of the institution, the most broadly marked of which are connected with the right to have only one wife — *monogamy;* or a plurality of wives — *polygamy.* The latter, in addition to its implying permission to have more wives than one — *polygamy,* is held to include the permission for a woman to have several husbands — *polyandry,* a state of society which, however repugnant to our notions, is known to have existed in ancient times, and still exists in various localities, as in Tibet. Among the most civilized communities monogamy is the prevailing practice, possessing among other advantages a simplicity in defining the obligations of parents to their progeny not easily attainable where polygamy is allowed. There are three modes of acquiring property — capture, gift, or sale; and as in the earliest times a man's daughters were regarded as his property, he parted with them only on recognized commercial principles. Hence in ancient law the marriage relation is founded on the contract of sale, and the wife came into the possession of her husband, like other chattels, when delivery had been made after payment of the stipulated price. Therefore the conducting of the bride to her husband's house was an important and generally an imposing ceremony. The parties themselves were seldom consulted in cases of marriage, the arrangements being instituted and completed, and the contract carried out, by the heads of the families. In the progress of civilization, however, the children were allowed greater freedom of action, and effect was given to individual likings by permitting a choice. The common law now treats marriage as a civil contract, and holds it to be valid only where it is entered into by persons able and willing to contract according to established solemnities. It is essential that each of the parties must have exercised free-will, for it is the consent which constitutes the marriage. Though the Roman Catholic Church ranks it among the sacraments, and religious observances are almost everywhere customary on its celebration, the law regards it as nothing more than a civil contract. For a detailed survey of modern matrimonial methods see Marriage and Divorce in the United States.

Marriage and Divorce in the United States. I. Marriage.— The foundation of the marriage laws of the United States was laid long before the Revolution. Important features have been pruned away and others have been changed or added; but in outline the existing forms of celebration, the modes of registration, and the essential elements of matrimonial jurisprudence had already arisen. After the Reformation it was inevitable that the state should sometime take control of the marriage institution. This was first realized by the Puritans in the Netherlands. On 1 April 1580, after the independence from Spain had been declared, the provinces of Holland and East Friesland established a civil marriage form, permissively even for the members of the Reformed Church, and in principle this law was adopted by the States-General for the United Provinces in 1656. Already in England Milton was arguing that ministers should not "meddle" with marriages; and in 1653 the great civil marriage ordinance of Cromwell was passed. By this act obligatory celebration before a justice of the peace was instituted; and a careful system of lay notice, certificate, and record was established. Furthermore the same ideas actuating their brethren in England and Holland were bearing fruit among the Puritans and Independents in America.

From the beginning, in all the New England colonies, obligatory civil marriage was either practised or authorized by law. Considering the times an excellent system of notice, license, and registration was speedily developed. Save for the brief period of the Commonwealth, the mother country had nothing to compare with it until the civil marriage laws of 1836 appeared. For many years celebration before a clergyman as such was illegal. The first marriages solemnized by religious rites took place in the Andros period. But later throughout New England the religious ceremony was sanctioned; and long before the close of the provincial era the present dual system of lay or religious celebration, at the option of the contracting parties, was in full use. In the middle colonies also the optional plan existed; but the matrimonial laws of the South were enacted mainly under the influence of the Established Church. In Maryland, however, until 1777 either the religious or the lay celebration was permitted; except that after 1717 members of the Established Church were required to conform to the English ritual. Under restrictions in favor of the church civil marriage was likewise permitted in the Carolinas; and by custom the optional system seems also to have existed in Georgia, where before the Revolution there was no legislation on the subject. In Virginia the religious ceremony according to the forms of the English Church was prescribed. Not until 1780 were dissenters there allowed to celebrate wedlock according to their own rites; while three years later was taken the first step toward civil marriage. But in Virginia as well as in the Carolinas the dissenters often took the law into their own hands, marrying in accordance with their own religious customs, or resorting to the civil magistrate. At the Revolution, therefore, it seemed clear that the American type of matrimonial law and administration, as first developed in the New England colonies, must eventually triumph throughout the land. Yet, if after a century and a quarter of legislation, the fifty-three codes of matrimonial law now existing in the States — using «States» in this article to include the continental and insular districts and territories — reveal in their broader features an approximation to a common system; in their details they disclose almost infinite diversity and conflict, often attended by a want of clearness and precision.

State Laws.— Everywhere in effect, though not always expressly, matrimony is treated as a relation partaking of the nature of both contract and status. Many of the States have enacted formal definitions. In Indiana, Oregon, and Washington marriage is defined briefly as a civil contract; in Arkansas, Colorado, Indian Territory, Iowa, Kansas, Missouri, Nebraska, New Mexico, Oklahoma, and Wyoming, as a civil contract to which the consent of parties capable in law of contracting is essential; in Michigan, Minnesota, Nevada, New York, and Wisconsin it is such a contract «so far as its validity in law is concerned»; while in Alaska it is a civil contract which may be entered into by males of 21 and females of 18 years, otherwise capable. The code of Porto Rico declares that «marriage is a civil institution, originating in a civil contract whereby a man and a woman mutually agree to become husband and wife and to discharge toward each other the duties imposed by law. It is valid only when contracted and solemnized in accordance with provisions of law.» Several commonwealths have sanctioned a definition which seems to imply the element of status in the marital relation. Thus by the laws of California, Idaho, Montana, North Dakota, and South Dakota, marriage is a personal relation, arising out of a civil contract to which the consent of parties capable of making it necessary. In North Dakota, although marriage is a personal relation so arising, it must be «entered into, maintained, annulled, or dissolved» only as provided by law; in California, since the reform of 1895, consent must be followed by a solemnization authorized by the code; and in South Dakota the consent to a marriage «must be to one commencing instantly, and not to an agreement to marry afterwards.» The law of Ohio is similar; and in Idaho and California neither party to a nuptial contract is «bound by a promise made in ignorance of the other's want of personal chastity, and either is released therefrom by unchaste conduct» of the other, unless both participated therein. The law of Louisiana «considers marriage in no other view than as a civil contract. . . . Such marriages only are recognized by law as are contracted and solemnized according to the rules which it prescribes.» Since they are thus considered by the law merely as civil contracts, «it sanctions all those marriages where the parties, at the time of making them, were (1) willing to contract; (2) able to contract; (3) did contract pursuant to the forms and solemnities prescribed.» In Georgia, «to constitute a valid marriage . . . there must be (1) parties able to contract; (2) an actual contract; (3) consummation according to law.» To constitute an actual contract «the parties must be consenting thereto voluntarily, and without any fraud practised upon either. Drunkenness at the time of marriage, brought about by art or contrivance to induce consent,» is held to be a fraud.

The Age of Consent.— The statutes of most of the States prescribe the minimum age of consent to marriage — not to be confused with the «age of consent» to carnal union under the criminal laws enacted to protect a child from legally agreeing to her own ruin; and where the statute is silent the common law age of 12 years for females and 14 for males is probably in force. For males the age is 21 in Alaska and Washington; 18 in Arizona, California, Delaware, Idaho, Indiana, Michigan, Minnesota, Montana, Nebraska, Nevada, New Mexico, New York, Ohio, Oklahoma, Oregon, Porto Rico, South Dakota, West Virginia, Wisconsin, and Wyoming; 17 in Alabama, Arkansas, Georgia, Illinois, and Indian Territory; 16 in District of Columbia, Iowa, North Carolina, North Dakota, Texas, and Utah; 15 in Kansas; and only 14 in Kentucky, Louisiana, and Virginia. For females the age is 18 in Alaska, Idaho, New York, and Washington; 16 in Arizona, Delaware, Indiana, Michigan, Montana, Nebraska, Nevada, Ohio, Porto Rico, West Virginia, and Wyoming; 15 in California, Minnesota, New Mexico, Oklahoma, Oregon, South Dakota, and Wisconsin; 14 in Alabama, Arkansas, District of Columbia, Georgia, Illinois, Indian Territory, Iowa, North Carolina, Texas, and Utah; 13 in New Hampshire and North Dakota; and only 12 in Kansas, Kentucky, Louisiana, and Virginia. But the Porto Rico code provides that a marriage under the age of consent «shall, nevertheless, be valid *ipso facto* and without an express declaration, if one day after having arrived at the legal age of puberty the parties shall have lived together without the representatives of either of them having brought suit against its validity, or if the woman shall have conceived before the legal age of puberty or before having established such suit.»

The age below which the consent of parent or guardian is required for the marriage of a minor is prescribed in the majority of the States. Such consent must precede the granting of license; or, where the license system has not been adopted, it must be made known by certificate or otherwise to the person or society conducting the celebration before the ceremony may be performed. For males the age is 21 years in Alabama, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Illinois, Indiana, Indian Territory, Iowa, Kentucky, Louisiana, Maryland, Massachusetts, Maine, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Jersey, New Mexico, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Porto Rico, Rhode Island, South Dakota, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming; 18 in Idaho and North Carolina; and 16 years in Tennessee. For females the age is 21 years in Connecticut, Florida, Kentucky, Louisiana, Pennsylvania, Porto Rico, Rhode Island, Virginia, West Virginia, and Wyoming; 18 in Alabama, Arkansas, California, Colorado, Delaware, Illinois, Indiana, Indian Territory, Iowa, Massachusetts, Maine, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Jersey, New Mexico, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, South Dakota, Texas, Utah, Vermont, Washington, and Wisconsin; and only 16 in Arizona, District of Columbia, Idaho, Maryland, and Tennessee. The age for females is 18 in Georgia; but by the statutes of that State parental consent does not seem to be required for male minors, nor for females when publication is by banns. In effect the same appears to be the case in South Carolina, since a penalty is affixed for marrying a female under 16 without parental consent; while for male minors such consent is not prescribed. In some cases the statute contains important special provisions regarding the marriage of minors which modify the general rule as to age and parental consent. Thus in Maine and Massachusetts consent is only required when the minor has a parent or guardian living in the commonwealth. The Rhode Island law expressly provides that a license may be issued to a person of over 18 years when such person has no parent or guardian residing in the State; and the same is true in Connecticut of a female under age when a selectman of the town where she has last resided six months gives his consent. In Alabama, Florida, Maryland, Virginia, West Virginia, and the District of Columbia, as in some other States, it is expressly provided that parental consent is not required if the minor has been previously married. By a law of Kentucky, if a female under 16 marry without legal consent, a court in her county having general equity jurisdiction may commit her estate to a receiver, who under direction of the court, may pay out the profits, after due compensation, to her separate use during infancy. At the age of 21, the estate is to be delivered to her, unless the court think fit to continue it longer in the receiver's hands. Under similar conditions in West Virginia the county court is empowered, «upon petition of her next friend,» to commit the estate of a girl between 12 and 14 years of age to a receiver, who is to give bond for the faithful performance of his trust.

Licenses.— With few exceptions, the simple license system now prevails throughout the country. Only in Delaware, Georgia, Ohio, and Maryland does the ancient optional plan of either oral ecclesiastical banns or civil license survive. In New York the license must be obtained in the county of the bride's residence, regardless of the place where the marriage ceremony is to be performed. In New York and California both parties have to go for the license; but not in New Jersey. In New Jersey the marriage certificate is filed in the Bureau of Vital Statistics. All the other States, except Alaska, New Mexico, and South Carolina, where there is no statute on the subject, have each a law for civil license, the same in its purpose, but varying widely in the forms and procedure prescribed. Thus in Minnesota, to take a typical example, «previous to persons being joined in marriage, a license shall be obtained from the clerk of the district court of the county in which the female resides,» or, if she be not a resident of the State, then from the same officer «in the county where the marriage is to take place in the State.» The clerk may inquire of the parties under oath as to the legality of the proposed marriage. If he «shall be satisfied that there is no legal impediment thereto,» he shall grant a license and make a record thereof. Persons under age and not having had a former husband or wife must have the consent of the parents or guardians personally given or certified under their hands and seals, «attested by two witnesses, one of whom shall appear before said clerk, and make oath or affirmation that he saw said parent or guardian subscribe, or heard him or her acknowledge the same.» If a «clerk shall in any other manner issue or sign any marriage license, he shall forfeit and pay a sum not exceeding $1,000,» to the parties aggrieved. In this State the statute allows the clerk a fee of two dollars for each license issued. Similar powers and functions are exercised by the clerk of the district court in Iowa, Louisiana, and Montana; county clerk in California, Colorado, Illinois, Kentucky, Michigan, Nevada, Oregon, Utah, Wisconsin, and Wyoming; clerk of the circuit court in Indiana, Iowa, Mississippi, Maryland, South Dakota, and Texas; probate judge in Alabama, Kansas, and Ohio; county judge in Florida, Nebraska, and North Dakota; clerk of the probate court in Arizona; clerk of the Supreme Court in the District of Columbia; clerk of the county court in Arkansas, Tennessee, and West Virginia; clerk of the court of chancery in Virginia; county register or recorder of deeds in North Carolina and Missouri; county recorder in Idaho; county ordinary or his deputy in Georgia; and the county auditor in Washington. In the six New England States the license, or «certificate,» as it is usually called, is issued by the clerk or registrar of the city or town; and in Massachusetts a town of more than 2,000 inhabitants may choose a person other than the clerk to be registrar. The laws of the various States show great diversity and lack of precision regarding the place of obtaining the license and that of making return of the celebration. In some States the license must be secured in the place of the bride's residence; in others, in that of the marriage; while in a third group, it may be issued in the place where either person dwells. Indeed, Pennsylvania, more liberal still, allows a choice among all three places. The same laxity exists as to the place of return; and sometimes the place of return is not the same as that of issue. There are other grave defects in the license laws. The oath administered to the bride or bridegroom by the officer, to guard against illegal contracts, is usually permissive, not obligatory; and where parental consent to the marriage of minors is given in writing, the affidavit of at least one witness is not always required. In Porto Rico the municipal judge may not grant or refuse a marriage license until ten days after the examination on oath of the persons applying therefor. Nowhere else is there any adequate provision regarding notice or the filing and trial of objections to a proposed marriage. Maine and Wisconsin have each made a good beginning by requiring the certificate or license to be procured five days before the celebration; and New Jersey exacts the same delay in case of non-residents. No other State seems to have a similar provision; and in all cases, apparently, except in Porto Rico, the license is issued at the time the notice of intention to marry is filed. But some of the States have provided special safeguards against clandestine marriages. Massachusetts has thus taken wise precautions regarding the licensing of young minors. By an act of 1894 no town or city clerk is permitted to receive a notice of the intention of marriage of any male under 18 or any female under 16 years of age, unless the «judge of probate in each county after due hearing» shall «make an order allowing the marriage under the age specified»; but such order may be issued only when the minor resides in the county where the judge holds court, or when the father, mother, or guardian gives consent. A law of 1899 allows the probate judge to make a similar order in case of a person of either sex whose age is alleged to exceed that just specified, but who is unable from any cause to produce official record of his or her birth, to overcome the reasonable doubt of the clerk or registrar. In Alabama, before issuance of a license for the marriage of persons under the ages of 21 and 18 respectively, the judge of probate, in addition to parental consent, «must also require a bond to be executed in the penal sum of two hundred dollars» payable to the State, «with condition to be void if there is no lawful cause why such marriage should not be celebrated.» In all cases a similar bond is required in Arkansas, Indian Territory, and Tennessee; as also in Kentucky when the persons are personally unknown to the clerk. By the code of Porto Rico (1902) the «persons desiring to contract marriage shall first present themselves before the municipal judge of their domicil if they shall have the same domicil, otherwise to their respective municipal courts and first being duly sworn, shall be examined by the municipal judge as to their legal capacities and incapacities to enter into matrimony.»

Ceremony.— With two exceptions the optional civil or religious celebration is now authorized by all the States. In West Virginia, and in Maryland since 1777, only the religious ceremony is provided for. Elsewhere marriage may be solemnized before the ministers or priests of every denomination; religious societies having no priests; or before the civil magistrate. The laws are lax regarding the district within which the civil or clerical celebrant may act. Only in a very few instances, as in Massachusetts, Rhode Island, and Vermont, is authority conferred only upon ministers dwelling within the State; while in the great majority of States, although the statutes are often far from clear, all qualified ministers, residing anywhere in the United States, may act. Indeed, Louisiana is still more generous, granting full privilege to celebrate wedlock to any clergyman or priest, «whether a citizen of the United States or not.» Nowhere are the minister's functions confined to the town, county, or other local district of his permanent residence, as was the case under the early laws of some of the older commonwealths. Only in a few cases are adequate proofs of ordination exacted. Virginia and West Virginia each require from the minister a bond for the faithful performance of his trust, in addition to credentials of ordination and good standing. Rhode Island has a careful system of registration; in Maine and New Hampshire the clerical celebrant must secure a «commission» from the governor; in Nevada, Minnesota, Wisconsin, and Arkansas, he must file his credentials with the proper county officer and receive a certificate; Ohio demands a license from the county judge of probate; but usually no such precautions are required. Throughout the country the justice of the peace is the «normal» civil magistrate for the celebration of wedlock; but usually the judges of the county and higher courts of record are given like authority. In Vermont the justice of the peace is the sole officer empowered. On the other hand, in Rhode Island, only justices of the supreme court may perform the lay ceremony; while in Virginia the justice of the peace as such is not recognized; but «the court of every county which deems it expedient, may appoint one or more persons resident in such county to celebrate the rites of marriage within the same, or a particular district thereof,» provided a bond be given as in the case of the ordained minister. Besides the judicial magistrates, authority to solemnize wedlock is conferred *ex officio* upon a variety of other functionaries; as upon aldermen and police magistrates in New York; the governor in Idaho; city mayors in Iowa, Montana, Idaho, Utah, and South Dakota; speakers of the house and senate in Tennessee; and the county supervisors in Mississippi. At present only in 21 States is the justice of the peace or corresponding local officer, in the discharge of his duties as celebrant, confined to his own county or district. Elsewhere he may act anywhere within the State; and this is almost universally the rule with the higher judges and officials who are granted the same power. In no case, except in Virginia and Massachusetts, is there any provision for the appointment of a person to celebrate wedlock for an area of less extent than the county; and nowhere, unless in Virginia, does the law provide for the special office of marriage celebrant. Massachusetts has, however, taken a step in the right direction. By an act of 1899 no justice of the peace may solemnize a marriage unless he also holds the office of city or town clerk, city registrar, clerk of a court, or that of assistant in each case; or «unless he shall have been specially designated by the governor.» The latter may at his discretion name justices of the peace «who may solemnize marriages in the city or town in which they severally reside.» Each place is to have at least one such designated magistrate; but otherwise the number is not to exceed one for every 5,000 of its inhabitants. No justice may act without a certificate of designation, which the governor has power to revoke whenever he thinks fit.

No definite formula for the celebration is anywhere prescribed. Sometimes the statute contains a statement to that effect. Thus in Tennessee it is expressly enacted that no formal ceremony is required, except that the parties «shall respectively declare, in the presence of the minister or officer, that they accept each other as man and wife»; and substantially the same declaration is specified in the laws of California, Idaho, Michigan, Minnesota, Nebraska, Nevada, North Dakota, South Dakota, Oregon, Pennsylvania, Washington, Wisconsin, and Wyoming. The same is true of New York when the ceremony is performed by a magistrate; but when a clergyman officiates, it may be «according to the forms and customs of the church or society to which he belongs.» The Oklahoma law requires the marriage to be «contracted by a formal ceremony» in the presence of two witnesses. The consent of persons «who may be lawfully married,» according to the North Carolina statute, «presently to take each other as husband and wife, freely, seriously, and plainly expressed by each in the presence of the other and in the presence» of a minister or justice, and the consequent declaration by him that they «are man and wife, shall be a valid and sufficient marriage.» In New Hampshire persons living together and acknowledging each other as husband and wife, and generally reputed to be such for the period of three years or until the death of one of them, shall thereafter be deemed to have been lawfully married. A similar law exists in Arizona, except that the requisite period of living together is one year.

Witnesses.— The statutes of many of the States require witnesses at the ceremony. One witness must attend in South Dakota; two in Alaska, Idaho, Michigan, Montana, Minnesota, Nebraska, Nevada, North Dakota, Oklahoma, Oregon, Porto Rico, Rhode Island, Washington, Wisconsin, and Wyoming; three in Louisiana; while in New York one witness is sufficient when the celebration takes place before a minister or magistrate and two when the marriage is by a written contract. In Maryland, in the case of Quaker weddings, the marriage certificate must be signed by 12 persons present. The statutory requirement of 12 witnesses in Pennsylvania is no longer enforced; but in that State two witnesses must attend «when any marriage is solemnized by the parties themselves.» Sometimes, as in California and New Jersey, the statute seems to take for granted the presence of witnesses without expressly requiring it.

Certificates.— Provision for giving a certificate to the persons married, by request or otherwise, is made in Alaska, California, District of Columbia, Idaho, Iowa, Maryland, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New York, Oregon, Pennsylvania, Porto Rico, South Dakota, Washington, Wisconsin, and Wyoming. Elsewhere by custom certificates are doubtless usually given without direct legal requirement.

Records.— In California, Delaware, Idaho, Iowa, Kentucky, Michigan, Missouri, Nevada, New Mexico, New York, New Jersey, Ohio, South Dakota, and Wisconsin the celebrant is required to keep a record. The same is true of the Quakers in Maryland; and of the pastors of all religious societies in Alabama and Mississippi. Almost universally the clerk or other officer of the county or town must register the facts contained in the license issued or the certificate returned. Moreover 22 commonwealths have established State systems of registration. These are Arkansas, California, Connecticut, Delaware, Indiana, Iowa, Kansas, Kentucky, Massachusetts, Maine, Michigan, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Ohio, Rhode Island, Vermont, Virginia, West Virginia, and Wisconsin. The New England States, in particular, have made careful provision for the completion and preservation of their marriage records; and for the collection and publication of marriage and divorce statistics.

Prohibitions.— The laws of all the States contain each a list or a definition of the kindred by blood or affinity with whom marriage is prohibited. In all cases, unless in Tennessee, expressly or by implication, marriage with a niece or a nephew is forbidden; while first cousins may not lawfully wed in Arizona, Arkansas, Illinois, Indiana, Indian Territory, Kansas, Louisiana (1900), Michigan (1903), Missouri, Nevada, New Hampshire, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania (1901), South Dakota, Washington, Wyoming, and apparently in Colorado. In Alaska persons related within the fourth degree either of the whole or the half-blood may not marry; while in Porto Rico (Code, 1902) the restraint extends to all descendants by blood or affinity and to «collaterals of consanguinity» within the fourth degree. In no case is marriage with a deceased wife's sister or a deceased husband's brother prohibited by the existing laws. As a general rule marriages within the forbidden degrees are void or voidable; but there are some exceptions, the statutes being often far from clear. The code of Porto Rico expressly provides that «the district courts may for good cause, on petition of an interested party, waive the impediment of the fourth degree of consanguinity.» Marriages are everywhere prohibited and are rendered void or voidable for a great variety of causes other than kinship or affinity; but the statutes are in this respect exceedingly conflicting and confusing, disclosing a great diversity of conditional or qualifying clauses which make any attempt at a summary here impracticable.

Miscegenation.— Nearly all the southern and some other States have enacted rigorous laws to prevent miscegenation, often defining the exact fractional part of African or Mongolian blood which shall vitiate a marriage. Such statutes against marriage with persons of negro blood exist in Alabama, Arizona, Arkansas, California, Colorado, Delaware, Florida, Georgia, Idaho, Indiana, Indian Territory, Kentucky, Louisiana, Maine, Maryland, Mississippi, Missouri, Nebraska, Nevada, North Carolina, Oklahoma, Oregon, South Carolina, Tennessee, Texas, Utah, Virginia, and West Virginia. The prohibition includes persons of Chinese or «Mongolian» blood in Arizona, California, Mississippi, Nevada, Oregon, and Utah.

Pauperism.— The statutes of several States are particularly interesting as indicating the most recent trend of social legislation. Thus Delaware has attempted to put some limit upon the increase of the indigent and incapable classes, the marriage of paupers being forbidden under penalty. Maine has a similar law; while in Vermont a license may not be issued for the marriage of paupers without the written consent of the selectmen or overseer of the poor of each of the towns where the parties reside, or which are liable for their support. Michigan has taken a still more important step in advance. By a stringent act of 1899 no person afflicted with certain syphilitic diseases «shall be capable of contracting marriage,» transgression of the law being severely punished as a felony. In 1895 Connecticut prohibited the marriage of a couple either of whom is epileptic, imbecile, or feeble-minded, when the woman is under 45 years of age; and this enlightened policy was followed in laws containing the same prohibition by Minnesota in 1901 and by Kansas in 1903.

Common Law Marriages.—It remains to consider the so-called «common-law marriage» in its relation to the statutes. According to the prevailing doctrine of the courts the laws requiring license, solemnization, or other formalities must be interpreted as «directory,» not «mandatory,» unless they contain «words of nullity» clearly declaring marriages void if contracted contrary to their provisions. Thus the canonical conflict between «legality» and «validity» is in effect perpetuated in the United States; and it is a most fruitful source of evil. At present the validity of the informal or common-law marriage is sustained by the decisions of the courts in Alabama, Arkansas, Colorado, District of Columbia, Florida, Georgia, Illinois, Iowa, Indiana, Kansas, Louisiana, Michigan, Minnesota, Missouri, Nebraska, Nevada, Ohio, Pennsylvania, South Carolina, and Wisconsin; by the later decisions in Tennessee (1860–70), and Texas (1894–9); while it is favored by those of New Jersey. On the other hand, in 1810, Chief Justice Parsons of Massachusetts repudiated the common-law agreement, holding that a solemnization according to law was essential to a valid marriage. This precedent has been followed by the courts of Maryland, North Carolina, Oregon, Washington, Vermont, and West Virginia; and favored by the early decisions of Maine and New Hampshire, although in those States the law is regarded as not conclusively settled. Furthermore Kentucky in 1852, Mississippi in 1892, California in 1895, Utah in 1898, and New York in 1901 have superseded the common-law contract through statutes containing the nullifying clause. In the remaining States the courts have not yet reached a decision; but were the question brought to a judicial test, the statutes remaining as they are, it is almost certain that, with one or two exceptions, all these commonwealths would sustain the validity of the informal agreement. It is clear that the needed reform can only be attained through stringent legislation.

II. Divorce.— The American type of divorce legislation has its origin in the provincial era. In the five southern colonies before the Revolution no instance of either full divorce or separation from bed and board has been discovered. The statute-book is entirely silent on the subject. Separations by mutual consent or for bad conduct or parol separations in some form did indeed occur; and in such cases the courts sometimes granted separate alimony. But in the South tribunals with either common law or statutory jurisdiction in divorce suits were not established; and no example of legislative divorce appears. The case is somewhat different for the middle colonies. In New York during the period of Dutch rule divorces were granted by the courts; and for a time after the English conquest in 1664 the migistrates may have continued the practice, doubtless under the supposed sanction of the Dutch law. But, unless on this ground during the brief period of transition, judicial divorce *a vinculo* ceased in New York with the English conquest. Courts competent to grant decrees for dissolution of marriage were not created. Except for a passage in the Duke's 'Laws'— which was a «dead letter» — there was no legislation on the subject. What has just been said of New York for the provincial era applies also to New Jersey. On the other hand, in Pennsylvania, a few absolute divorces were granted by the legislature; but there has been found no instance of a judicial decree for dissolution of wedlock.

Civil Divorce.— It was perhaps inevitable that civil divorce, the counterpart of civil marriage, should arise in the New England colonies. Liberty of divorce is the fruit of the Reformation; and it was especially favored by the more advanced or extreme Protestant societies. In most respects throughout New England the broad modern doctrines of the *Reformatio Legum* of Edward VI.'s commission, though even now not fully accepted in the mother country, were from the outset put in practice by Puritan and Separatist alike. The American conception of divorce as belonging, not to the criminal, but exclusively to the civil jurisdiction, has its birth in the 17th century. For more than 100 years in the New England colonies the canonical decree of separation from bed and board was practically though not wholly abandoned; while, on the other hand, a dissolution of the bond of matrimony was freely granted for adultery, desertion, and even on other grounds. For Massachusetts the records are but partially preserved. Between 1639 and 1692 some 40 actions for divorce or annulment have been discovered; while between 1739 and 1776 at least 47 such suits were tried by the courts. The complete record would doubtless disclose many more. The grounds of divorce are not formally specified in the statutes, but from these cases it appears that desertion by either party and adultery of the wife were accepted as adequate causes for dissolving a marriage. It should be noted that before the Revolution there is no clear instance in Massachusetts of granting a full divorce for the husband's adultery alone, unaccompanied by other offenses such as cruelty. The first discovered case of judicial separation from bed and board falls in the year 1754. Cruelty alone was deemed adequate ground for such separation, though, apparently, not for a full divorce. From 1650 onward Rhode Island authorized divorces *a vinculo*. By an act of that year, supplemented by other statutes in 1655 and 1685, adultery and desertion on the part of either spouse were recognized as legal grounds. This colony was especially afflicted by the evil of legislative divorce. Throughout nearly the entire provincial period the assembly, side by side with the courts, acted on divorce petitions, particularly when the grounds of complaint were not those recognized by statute. According to Judge Durfee, even after 1747, when the power to grant divorces came to the superior court, the jurisdiction of the assembly continued «to be invoked in exceptional cases, which either were not provided for by the statute or were too flimsy or too whimsical for judicial treatment» (*Gleanings*, 35–6). The divorce legislation of Connecticut gained a surprisingly early maturity. In the middle of the 17th century no society in the world, with the possible exception of Holland, possessed a system so modern in character. Separation from bed and board was rejected. Reasonable grounds of absolute divorce were sanctioned. Husband and wife were treated with even justice; and, although legislative divorce was permitted and liable to abuse the greater part of the litigation seems always to have been entrusted to the regular courts. As early at least as 1655 marriages were dissolved by the assembly; and in 1667 the first statute on the subject appeared. The court of assistants was then empowered to grant bills of divorce from the bond of wedlock, with the privilege of remarriage, for adultery, fraudulent contract, three years' wilful desertion with total neglect of duty, or for seven years' «providential» absence unheard of. These four grounds of absolute divorce, with scarcely the change of a word in the terms of the statute, were sanctioned by the laws of Connecticut until 1849, when two new causes—«habitual intemperance» and «intolerable cruelty»—were added.

State Legislation.—The essential principles of American divorce law were thus developed in the colonial period. Under the Federal Constitution the States within their respective borders have exclusive control of matrimonial and divorce legislation. Congress has conferred the same power upon the organized territories; but it legislates directly for the District of Columbia, Indian Territory, and Alaska. As a result there are fifty-two distinct divorce codes, whose provisions are inharmonious or conflicting, although in some of their vital features they are slowly approaching a common type. Almost everywhere exclusive jurisdiction in divorce suits is now vested in the district, superior, circuit, chancery, or other higher courts, sitting usually in the various counties. In New Jersey the court of Chancery has entire control; but apparently in every other State a number of tribunals are open to hear and determine divorce petitions. In 1887, according to the report of Commissioner Wright, there were in the whole country about 2,624 such tribunals. But in no instance has a special divorce court been created. Formerly the granting of divorces by the legislature was a widespread evil. In nearly all the States, directly or indirectly, it is now prohibited by constitutional enactment; and since 1886 Congress has put a stop to it in the Territories. Delaware discontinued the practice only under the constitution of 1897; while in Connecticut it still survives.

Divorce is not provided for by law in South Carolina. In the other 52 States divorce is permitted; while separation from bed and board is likewise allowed in Alabama, Arkansas, Delaware, District of Columbia, Georgia, Indiana (1903), Indian Territory, Kentucky, Louisiana, Maryland, Michigan, Minnesota, Nebraska, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, Tennessee, Vermont, Virginia, West Virginia, and Wisconsin. Furthermore, in Florida, Iowa, Kansas, Montana, Ohio, Utah, and Wyoming, the courts may decree separate maintenance which is practically the same as separation from bed and board. The number of statutory grounds of divorce *a vinculo* varies from one (adultery) in New York and the District of Columbia to 14 in New Hampshire. Adultery is a cause in all these States; desertion (abandonment, wilful absence) in all except New York and the District of Columbia; cruelty (actual violence, inhuman treatment, etc.), in all except these two with Maryland, New Jersey, North Carolina, Tennessee, Virginia, and West Virginia; habitual drunkenness (intoxication, intemperance) in all except Arizona, District of Columbia, Maryland, New Jersey, New York, North Carolina, Pennsylvania, Texas, Vermont, Virginia, and West Virginia; failure to provide for wife (or family) in Arizona, California, Colorado, Delaware, Idaho, Indiana, Maine, Massachusetts, Michigan, Montana, Nebraska, Nevada, New Mexico, North Dakota, Rhode Island, South Dakota, Utah, Vermont, Washington, Wisconsin, and Wyoming. Incurable insanity is a legal cause in Florida and Idaho; lunacy of the wife in Pennsylvania; «incurable, chronic mania or dementia» of either party in Washington; and vagrancy of the husband in Missouri and Wyoming. By the statute of Rhode Island a marriage may be dissolved when either party is guilty of «habitual, excessive, and intemperate use of opium, morphine, or chloral»; and a similar law exists in Maine, Massachusetts, Mississippi and Porto Rico. Many other legal causes of divorce are recognized, each in one or more States. For the whole country in 1887, according to the government report, 42 grounds of absolute, and 32 grounds of partial divorce were thus sanctioned by statute.

Re-marriage.—There is equal lack of uniformity in the laws regarding re-marriage after divorce. No restraint whatever is placed on the immediate re-marriage of either party with another in Arizona, Arkansas, Connecticut, Illinois, Indian Territory, Iowa, Maryland, Kentucky, Missouri, Nevada, New Hampshire, New Jersey, New Mexico, Ohio, Porto Rico, Texas, Utah, West Virginia, and Wyoming. Elsewhere restrictions are placed upon one or both of the parties either as a penalty or to allow time for proceedings in error or on appeal. Thus in Delaware since 1832 the person divorced for adultery is absolutely forbidden to marry the paramour. Marriage with the accomplice during the life of the former spouse is likewise unlawful in Pennsylvania since 1785, Tennessee since 1799, and Louisiana since 1827. Moreover, in Louisiana since 1808, the wife may not re-wed until 10 months after dissolution of the marriage, whether by death, divorce, or decree of nullity. Under the same conditions in Porto Rico the woman must wait 301 days, or until a child is born if pregnant at the time of the husband's death. By the North Carolina statute, where the ground of divorce is abandonment of the wife or such cruel treatment of her after removal to another State as to force her to return, the defendant is forbidden to marry again during the life of the aggrieved. The same restraint is laid on the defendant guilty of adultery in South Dakota and New York, although the parties to the action may re-marry. In New York, however, the defendant may marry again in case the court shall modify its judgment, «which modification shall only be made upon satisfactory proof that the complainant has re-married, that five years have elapsed since the decree of divorce was rendered, and that the conduct of the defendant since the dissolution of said marriage has been uniformly good.» The person who is the guilty cause of the divorce is restrained from marriage in Florida. By the act of 1901, in the District of Columbia the defendant is absolutely restrained from re-marriage except with the former spouse. In several States the placing of a restraint on further marriage is left to the court's discretion. So in Michigan the court may decree that the person against whom any divorce is granted shall not re-wed within any period not exceeding two years. Since 1857 in Mississippi the decree may provide «that a party against whom a divorce is granted because of adultery shall not be at liberty to marry again.» The same power is given the court in Virginia; but for good cause shown the tribunal rendering the decree of divorce may at any time remove the restraint on the marriage of the guilty party. By the existing code of Alabama, in all cases, the chancellor may in the decree direct whether the adverse party shall be permitted to marry again. In Georgia the jury according to whose verdict a decree of absolute divorce is granted determines the question of re-marriage, subject to the revision of the court; but provision is made for subsequent removal of any disability through the verdict of a new jury. Three of the New England States discriminate in this regard against the defendant. Since 1878, in Vermont, the libellee may not marry any person other than the libellant for three years, unless the latter dies. In Massachusetts since 1881 the offending party, without petition to the court, may remarry only after two years. Since 1883 the statute of Maine forbids the party obtaining the decree to re-wed in two years without the court's permission; while during that period the adverse party is absolutely restrained; nor at any later time may he marry without the court's consent. In Massachusetts, following the English precedent, the decree in the first instance must be a decree *nisi*, «to become absolute after the expiration of six months,» unless the court on the application of some interested person otherwise orders. Since 1883 the law of Maine in this regard has been practically identical with that of Massachusetts; while in 1902 an act of Rhode Island declares that no decree shall become final and operative until six months after trial and decision. In New York the decree in the first instance must be «interlocutory;» and three months must elapse before it can be made final. The latest legislation of California is somewhat similar. Until 1903 neither party was permitted to marry again within a year after the divorce. But persons evaded the law by going to Nevada, to get married, and then at once returning to California to reside. The validity of such contracts was sustained by a decision of the Supreme Court. To overcome the effect of this decision in the year named it was enacted that when the court «determines that a divorce ought to be granted an interlocutory judgment must be entered, declaring that the party in whose favor the court decides is entitled to a divorce.» After the expiration of a year the court may enter final judgment. In no case can a marriage of either party during the life of the other be valid, if contracted within one year after the interlocutory decree. This act is believed to be unconstitutional, and one of the superior courts has so decided.

A number of States have fixed a period within which neither party may marry again; and usually, if proceedings in error or on appeal be instituted, the restraint is further extended to the final judgment. The period is three months after the decree in North Dakota since 1901; six months in Kansas since 1881, Minnesota since 1901, Nebraska since 1885, Oklahoma since 1893, Oregon since 1862, Washington since 1893; and «more than six months» in Idaho since 1903. It is one year in Colorado since 1893 and in Wisconsin since 1901; while in Montana since 1895 the innocent person must needs wait two years and the guilty person three years before renewing the marital bond with anyone save the former spouse. In Alaska neither party may marry a third person until proceedings are determined on appeal, or if there be no appeal, within one year after the decree. The Nebraska law, in addition to the general restraint on both parties during six months, is unique in forbidding the defendant in error or appellee to marry again during the pendency of proceedings in error or on appeal under the penalty prescribed for bigamy; while in Kansas and Oklahoma, if appellate proceedings be had, the restraint on both parties extends to 30 days after final judgment on appeal. Since 1831, by the Indiana statute, either party is free to marry again immediately after divorce, except that when the defendant has been «constructively» summoned without other notice than publication in a newspaper, the person obtaining a decree is not permitted to re-wed until the expiration of two years, during which period the judgment may be opened at the instance of the defendant. In Wisconsin the court or judge granting the divorce «may authorize» marriage within the year. Expressly or by implication a number of States, except from the prohibition the re-marriage of the divorced couple. Such is the case in Alaska, California, Colorado, Idaho, Kansas, Montana, New York, Oklahoma, Oregon, South Dakota, Vermont, and Washington. On the question whether in the absence of statutory authority such re-marriage of the divorced persons with each other comes within the restriction, the decisions of the courts are conflicting (see Moore *v.* Moore, 8 Abb., N. C., 171; Colvin *v.* Colvin, 2 Paige, 385; Moore *v.* Hegeman, 92 N. Y., 521). Owing to the want of precision and uniformity in the legislation of the States the restraints placed on the marriage of divorced persons are practically futile. In 1829 the supreme court of Massachusetts (in Putnam *v.* Putnam, 8 Pick., 433–5) decided that if a man, «being a resident in this State, for the sake of evading the law goes into a neighboring State where such a marriage is valid, and is there married and immediately returns and continues to reside here, the marriage is valid here, and after his death his widow is entitled to dower in his estate.» This precedent was followed by New York in 1881 (Van Voorhis *v.* Brintnall, 86 N. Y., 18); Washington in 1900 (Willey *v.* Willey, 22 Wash., 115–121); and California in 1903, Estate of Wood, 137 Cal., 129). The prevailing doctrine of the courts appears to be that a marriage good where it is contracted is good everywhere; but there are opposing decisions.

Residence.— With the exception of Louisiana and, of course, South Carolina, all of the States make some statutory provision regarding the residence of the parties to a divorce suit. To prevent migration for divorce, the minimum requirement, where the plaintiff comes into the State after the cause of petition arose, has gradually been raised; but in some States the law is still too lax. At present the term of previous residence for the plaintiff, or at least for one of the parties, varies from six months to five years. It is six months in Nebraska since 1856, except when the marriage was solemnized in the State and the plaintiff has there dwelt since the marriage to the time when the suit is commenced; in Idaho since 1864; in South Dakota since 1899; while in Nevada since 1861 the plaintiff must have resided six months in the county where suit is brought, unless the action is begun «in the county in which the cause thereof shall have accrued, or in which the defendant shall reside, or be found, or in which the plaintiff shall reside if the latter be the county in which the parties last cohabited.» In Texas likewise the term for the plaintiff is six months in the county. The prevailing requirement is one year. Such is the case in Arizona, Arkansas, Indian Territory, New Mexico, Ohio, and Oklahoma; in California since 1891; Colorado since 1861, unless the application is made upon «grounds of adultery or extreme cruelty» and the offense is «committed within the State»; Georgia, where six months in the county is also prescribed; Illinois since 1827; and Porto Rico since 1902, unless the cause arose in the State or while one or both of the parties resided there; Iowa since 1838, except when the defendant is a resident of the State served by personal service; Kansas since 1855; Kentucky, where, as in Arkansas and Indian Territory, if the cause of divorce arose without the State the plaintiff must have been a resident of the State at the time, unless it was also a legal ground where it occurred or existed; Minnesota since 1851, except when the suit is on the ground of adultery committed while the plaintiff was a resident of the State; Missouri since 1835, unless the offense or injury complained of was committed within the State or when one or both of the parties resided there; Montana since 1865; North Dakota since 1899; Oregon since 1862; Pennsylvania since 1785; Utah since 1878; Vermont since 1878, three months' residence in the county of the action being also required; Washington since 1854; Wyoming since 1901; and Wisconsin since 1838, except when the cause is adultery committed while the plaintiff was a resident of the State, or when the marriage was solemnized in the State and the plaintiff has there resided since the marriage to the time of bringing suit, or when the wife is plaintiff and the husband has resided in the State for one year. The term of domicil or residence for at least one of the parties is also one year in New Hampshire, Virginia, and West Virginia; while in Mississippi the courts of chancery have jurisdiction when both parties are domiciled in the State when suit is brought; or when the complainant is so domiciled and the defendant is personally served with process in the State; or when one of the parties is thus domiciled and one or the other of them has been an actual resident for the preceding year. In Maine a divorce may be granted for legal cause if the libellant resided in the State when the cause of action occurred, or had so resided for one year before commencement of the suit, or if the libellee is a resident of the State (1903). A two years' term is prescribed for the plaintiff in North Carolina and Tennessee; in Florida unless the offense charged is adultery; in Maryland, for at least one of the parties, since 1842; in Indiana since 1873, six months in the county being also essential; and in Rhode Island since 1902, unless during that period the defendant has been a resident and domiciled inhabitant of the State and has actually been served with process. In Michigan since 1899, if the marriage was not solemnized in the State, the term of previous residence for the plaintiff is one year when the ground of action arises within, and two years when it arises outside the State. By Federal law two years' residence is required in Hawaii (1900), and two years' inhabitancy in Alaska (1903); while in the District of Columbia since 1901 the term of previous residence for the plaintiff is three years. A three years' period of «continuous» residence is likewise exacted in Connecticut, unless the cause of divorce arose after the plaintiff's removal into the State; or unless the defendant had in like manner there resided for three years and actual service was made upon him; or «unless the alleged cause is habitual intemperance, or intolerable cruelty, and the plaintiff was domiciled in the State at the time of the marriage» and before bringing the complaint has returned with the intention of there remaining. In Alabama, when the defendant lives outside the State, the plaintiff must have been a *bona fide* resident for one year before bringing suit; or for three years when abandonment is the cause alleged. By the New Jersey statute, in case of abandonment, one of the parties, at the time of filing the bill and for the term of two years during which the desertion shall have continued, must be a resident of the State; but when the cause is adultery committed outside the State, three years' residence on the part of either the complainant or the defendant is required. New York has no fixed term, except that in case of partial divorce, when the marriage was solemnized outside the State, the parties must have «continued to be residents» for at least one year, and the plaintiff must be resident at the time the action begins. No definite term is prescribed by the Delaware law; but a divorce from the bond of matrimony will not be decreed when the assigned cause took place out of the State and the «petitioner was a non-resident thereof at the time of the occurrence, unless for the same or like cause such divorce would be allowed by the laws of the State in which it is alleged to have occurred.» Finally, it may be noted that Massachusetts has the most stringent requirement. A divorce will be granted for any lawful cause, occurring in the State or elsewhere, when the libellant has lived for five years in the commonwealth; or, when the parties were inhabitants of the State at the time of the marriage, if the libellant has been such an inhabitant for three years before the libel was filed, provided neither came into the State for the purpose. With these exceptions, as expressly provided in the statute, a divorce will not be granted for any cause, if the parties have never lived together as man and wife in the commonwealth; nor for any cause occurring in another State or country, unless, before it occurred, they had so lived together in the commonwealth, and one of them was there living at the time it took place.

Massachusetts, like Maine, Delaware, and Tennessee, has attempted to prevent clandestine divorce through the evasion of the laws. When an inhabitant of the commonwealth goes outside the State to obtain a divorce for a cause which occurred in the State while the parties there resided, or for a cause which would not be recognized as lawful therein, the «divorce so obtained shall be of no force or effect» in the commonwealth.

Notice by Publication.— Nearly all of the States have made some provision regarding notice to the defendant in divorce suits. The majority are content to prescribe the usual procedure employed in ordinary civil or equity cases, according to the system in use. But some States have adopted special rules; and during the last 15 years a number of the older and a few of the younger commonwealths have enacted rigorous laws governing notice to the defendant when personal service cannot be had. But the abuse of constructive service through publication in the newspapers is still a widespread evil.

Alimony.— Everywhere the laws provide for temporary and permanent alimony to the wife, for the care and custody of the minor children, and for the disposal of the property. In a few instances, as in Massachusetts, New Hampshire, Oregon, Vermont, Virginia, Washington, and West Virginia, the courts are authorized to decree alimony or an allowance in the nature of alimony to the husband as well as to the wife. Generally divorce may be refused when there is collusion, connivance, condonation, or recrimination. Special provisions for defending divorce petitions exist in a number of States. Thus in Indiana and Washington the prosecuting attorney must resist all undefended petitions; in Kentucky the county attorney must resist every application for divorce whether defended or not; in Louisiana, when the defendant is absent or incapable of acting, an attorney shall be appointed by the court to defend him; in Michigan the prosecuting attorney shall appear in all suits where there are children under 14 years of age, and oppose the granting of a decree if he thinks their interest or the public good so requires; and similar laws exist in Idaho, Colorado, Oregon, and the District of Columbia. Soliciting divorce business by advertising or otherwise is sometimes prohibited under severe penalty; such being the case in California, Indiana, Minnesota, Ohio, and Washington. Only in Connecticut, Illinois, Indiana, Maine, Massachusetts, Michigan, New Hampshire, Ohio, Rhode Island, and Vermont apparently, is any adequate provision made for the collection or publication of divorce statistics.

Statistics.— Thus the divorce laws of the States, though still very defective and conflicting, show distinct improvement during recent years. More stringent provisions for notice have been made; longer terms of previous *bona fide* residence of the plaintiff required; more satisfactory conditions of re-marriage after the decree prescribed; while some of the dangerous «omnibus» clauses in the list of statutory grounds have been repealed. All this is due to a better informed public sentiment in the creation of which much credit must be given to the State Commissions on Uniform Legislation and especially to the National Divorce Reform League and its successor, the National League for the Protection of the Family. By the League, at the instance of its secretary, the Rev. Samuel Dike, was suggested the compilation of the elaborate 'Report on Marriage and Divorce in the United States,' prepared by Hon. Carroll D. Wright, Commissioner of Labor, and published in 1889. This report for the first time revealed something like the real facts regarding divorce in the United States. In the entire country during the period of 20 years (1867–86) covered by it, 328,716 petitions for full or partial divorce were granted. From 9,937 decrees in 1867, the number rose to 11,586 in 1871; 14,800 in 1876; 20,762 in 1881; and to 25,535 in 1886; showing an increase in 20 years of 157 per cent, while there was a gain in population of but 60 per cent during the same period. Comparing the last year with the first, only four States — Delaware, Connecticut, Maine, and Vermont — show a decrease in the divorce rate; while, more fairly, comparing the fourth quinquennium with the first, only the three States last named show such a decrease. Of the whole number of divorces during the period, 112,540 were granted to the husband, and 216,176 to the wife. Among the principal causes, at each stage of the wedded life, only for adultery, were more decrees granted on the husband's petition than on that of the wife. But the relative number granted on the wife's petition varies greatly; from 39.3 per cent in North Carolina to 77.9 in Nevada. «As regards the ratio of divorces to marriages, six States report marriages fully enough for a trustworthy comparison. Of these, Connecticut has for the entire period a divorce to 11.32 marriages, and for the worst year, 1875, one to

8.81; Rhode Island gives one to 11.11 for the period and one to 9.36 in 1884, closely approaching that for three preceding years; Vermont one to 16.96 for the period and at its worst, 1871, one to 13; Massachusetts gives one to 31.28 for the period, its worst being one to 22.54 in 1878; Ohio averages one to 20.65, with an almost unvarying progress downward to one to 15.16 in 1886»; and in the District of Columbia the rate for the period is 31.28, while at the best it is 74.65 in 1868, and at the worst 20.82 in 1877 (Dike in 'Political Science Quarterly,' iv., 607, summarizing Wright's Report, 135-39). This method of obtaining the rate is defective; for it disregards the large number of married couples whose marriages were solemnized before the period began. Hence, estimating the number of existing married couples, on the basis of the 11th census, in 1867, there were 173 divorces to 100,000 couples, and 250 in 1886 (Willcox, 'The Divorce Problem,' 2d ed., 16-19). The divorce rate in the United States is higher than in any other country for which divorce statistics are collected and published, with the single exception of Japan, being lowest in the southeastern and highest in the western and southwestern States. As in Europe, the divorce rate is higher and the marriage rate lower in the city than in the country. Again, as in Europe, while the marriage rate per capita of population is steadily descending, the divorce rate is on the average rising, although during the 20 years in the North Atlantic group of States — from Maine to Pennsylvania inclusive — there was no increase in the divorce rate.

According to Willcox the number of persons divorced (not the number of divorces) to every 100,000 of the population is as follows for various countries, the date being 1886 unless otherwise stated: Ireland, .28; Italy (1885), 3.75; England and Wales, 3.79; Canada, 4.81; Australia (including New Zealand and Tasmania), 11.14; German Empire, 25.97; France, 32.51; Switzerland, 64.49; United States, 88.71; Japan, 608-45 ("A Study in Vital Statistics," in 'Political Science Quarterly,' viii., 78). In the United States, as elsewhere, both the marriage rate and the divorce rate fall during war times and in periods of general industrial depression. According to the statistics presented in Wright's Report, the evil of migration for easy divorce has been much exaggerated in popular opinion. The improvements in the laws since 1886 have placed further restraints upon it; so that it can no longer, if ever, be regarded as the centre of the divorce problem. In the want of a later report — for which there is urgent need — the present divorce rate for the whole country cannot be determined. But from the available statistics furnished by the few States publishing reports it appears that in Rhode Island, Michigan, Ohio, and notably in Indiana the rate is rising; while it is falling in Connecticut and Massachusetts. It is probable that some other State would show a decreasing rate.

Generalization.— In conclusion it may be noted that the earlier movement for a uniform Federal law of divorce, to be secured through constitutional amendment, has in the main been abandoned. Instead it is preferred, through the State Commissions on Uniform Legislation, to urge the adoption by the separate commonwealths of a model statute governing procedure, which has been recommended by the commissions. See also DIVORCE.

Bibliography.— A digest of the laws of all the States for 1886-7, the time of compilation, is contained in Wright's 'Report on Marriage and Divorce in the United States' 1867-86 (Washington 1889); reprinted without change (1897). See also the summaries in Stimson, 'American Statute Law (1886); Noble, 'Compendium and Comparative View of the Thirty-Eight State Laws of Marriage and Divorce' (1882); Hirsh, 'Tabulated Digest of the Divorce Laws of the United States' (1901); Lloyd, 'Treatise on the Law of Divorce' (1887); Convers, 'Marriage and Divorce in the United States' (1889); Snyder, 'The Geography of Marriage or the Legal Perplexities of Wedlock in the United States' (1889); Whitney, 'Marriage and Divorce' (1894); Woolsey, 'Divorce and Divorce Legislation' (1882); Pearson, 'National Life and Character' (1893); answered by Muirhead, in 'International Journal of Ethics,' vii. In favor of radical reform are Stetson, 'Women and Economics' (1900); Besant, 'Marriage; as it was, as it is, and as it should be'; Pearson, 'Ethics of Free Thought' (1888); and Caird, 'The Morality of Marriage' (1897).

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Married Woman, Status of, in Law. See LAW OF HUSBAND AND WIFE, THE.

Marrow, a substance of low specific gravity filling the cells and cavities of the bones of mammals. See BONE.

Marryat, măr'ĭ-ạt, **Florence**, English novelist, daughter of Frederick Marryat (q.v.): b. Brighton 9 July 1838; d. London 27 Oct. 1899. She was successively Mrs. Church (1854-90) and Mrs. Francis Lean. Her many novels, although not at all remarkable, were popular, and were published in various versions throughout Europe. They include 'Nelly Brooke', 'Fighting the Air,' 'Facing the Footlights,' and more than 80 others, many being occupied with spiritualism. She published and edited her father's 'Life and Letters' (1872).

Marryat, Frederick, English naval officer and novelist: b. London 10 July 1792; d. Langham, Norfolk, 9 Aug. 1848. In 1806 he entered the navy, served on the coast of North America in 1811 in the Æolus and in 1823 was commander of the Larne during the first Burmese war, in 1825 had the naval command of a successful expedition up the Bassein River, and in the same year was made captain of the Tees. From 1828 until his resignation in 1830 he commanded the Ariadne. He received the gold medal of the Royal Humane Society (1818) for saving life at sea; adapted to the mercantile marine Sir Home Popham's system of signaling; was elected fellow of the Royal Society in 1819; and was also something of a caricature artist. He is best known, however, for his stories of the sea, beginning in 1829 with 'The Naval Officer.' The most familiar of them is 'Midshipman Easy' (1836), in which his chief characteristics, lifelike and circumstantial narration and a rollicking humor, appear perhaps at their best. Others of the series are 'The King's Own' (1830), probably the best constructed of his works; 'Newton Forster' (1832); 'Peter Simple' (1834); 'Jacob Faithful' (1834); 'The

Pacha of Many Tales' (1835); 'The Pirate, and the Three Cutters' (1836); 'Snarleyyow' (1837); 'The Phantom Ship' (1839); 'Poor Jack' (1840); 'The Privateer's Man' (1846). He wrote also a series of juveniles, chief of them 'Masterman Ready' (1841). He visited Canada and the United States in 1837–8; and recorded his impressions in 'A Diary in America' (1839), which gave some offense to the people of the nation, then hypersensitive to foreign criticism. In 1832–5 he edited the 'Metropolitan Magazine,' in which he published a review of N. P. Willis' 'Pencillings by the Way,' which the latter, then in England, considered abusive. Willis challenged Marryat, and they exchanged shots at Chatham without injury. Consult F. Marryat (q.v.), 'Life and Correspondence' (1872); Hannay, 'Life' (in 'Great Writers' series).

Mars, Anne Françoise Hippolyte Boutet Monvel, ăn frăṅ-swäz ē-pō-lēt boo-tā môṅ-vĕl mărs, usually called MADEMOISELLE MARS, French actress: b. Paris 5 Feb. 1779; d. there 20 March 1847. As Célimène in Molière's 'Misanthrope,' and Elmira in 'Tartuffe,' as well as in several similar characters in the plays of Marivaux, she was very great. Louis XVIII. settled on her, as well as on Talma, a pension of 30,000 francs. She retired in 1841.

Mars, märz, in astronomy, a planet, 141,000,000 miles from the sun. Its diameter is 4,200 miles. Its years contain 687 days. Its mean distance at opposition from the earth is 48,000,000 miles. The day on Mars is half an hour longer than ours, or about 24 hours and 37 minutes. It has two moons. It moves at the rate of 15 miles a second. Mars is the fourth planet from the sun, and is called the red planet, from its well-known color. The combination of its motion with ours causes it to pass behind us, or opposite to the sun, once in two years. For two months at this period it is best seen, and appears as a red lamp in the sky; at other times it looks small and unimportant. Its density and size are less than ours; a man weighing 200 pounds here would weigh but 75 pounds on Mars. The orbit of this planet is decidedly elliptical; it is 26,000,000 miles nearer the sun at the nearest part of its orbit than it is at the farthest, consequently the variation in heat from this cause alone is considerable. In many ways Mars resembles our earth; it has atmosphere, seasons, land, water, storms, clouds, and mountains. Snow and ice cover both its poles, and produce great white patches at those points, which are clearly seen through a large telescope; they are found to vary in size with the seasons, being largest during the Martian winter. The canals were first mapped in large numbers by Schiaparelli, although a few of them had been previously observed by other astronomers. They consist of narrow dark lines, generally straight, forming a network over the whole surface of the planet. At their junctions we often find small black dots, known as lakes or oases. Large areas of the planet, called seas, are of a dark gray color, but most of the surface is yellow, or, if observed by daylight, orange. The cause of all the dark regions is probably vegetation, with the exception of the two very black lines which are seen to surround the snow caps when they are melting. These two lines are temporary in their nature, and form the only true oceans of the planet. Occasionally they attain a breadth in some places of 300 or 400 miles, and are then found to be of a dark blue color. The polariscope shows that, unlike the rest of Mars, their surfaces are shiny. The yellow regions are thought to be deserts. They cover more than half the entire surface. Very marked changes sometimes appear in the finer details when the snow is melting most rapidly. At the approach of the Martian autumn those parts of the dark areas that are near the poles are seen to fade out and turn yellow so as to be indistinguishable from the soil of the planet.

The moons of Mars were discovered by Asaph Hall in 1877. The outer and smaller one is probably less than 10 miles in diameter. The inner one revolves about the planet in seven hours and a half, apparently rising in the west, and goes through all its phases in a single night.

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Mars, in Roman mythology, contracted from *Mavers* or *Mavors,* in the Sabine or Oscan language *Mamers,* was at an early period identified by the Romans with the Greek *Ares.* As the Italian Mars was originally a divinity of a very different nature, the two conceptions must be treated separately. Originally Mars was an agricultural deity surnamed *Silvanus,* and propitiatory sacrifices were offered to him as the tutelary god of fields and flocks. As the Italian shepherds were familiar with war, the transition from the idea of Mars as an agricultural to that of a warlike deity was natural and easy. He was regarded as the father of the Roman people, for, according to tradition, Romulus and Remus, the founders of Rome, were the fruit of his intercourse with Rhea Sylvia. Several temples in Rome and the Campus Martius were dedicated to him, the most important of which was that outside the Porta Capena, on the Appian Road, and that of Mars Ultor, built by Augustus in the forum. His service was celebrated not only by particular *flamines* devoted to him, but by the College of the Salii, or priests of Mars. The month of March, the first month of the Roman year, was sacred to him, and his festivals were celebrated every year in the Circus on the 1st of August. The Campus Martius, where the Roman youth engaged in athletic and military exercises, was named after him. See ARES.

Marsala, mär-sä'lä, Sicily, a seaport town, near the mouth of a river of the same name, on the low promontory of Cape Boeo, 18 miles southwest of Trapani. It obtained its name from the Saracens, who valued the port so highly that they called it Marsa Alla, or Port of God. The harbor has been greatly improved. The most important export is Marsala wine, which resembles sherry.

Marseillaise, mär-sĕ-yāz, the celebrated song of the French Revolution, and the national anthem of the French. It was composed by Joseph Rouget de Lisle (q.v.) while an officer in the engineer corps at Strasburg, early in the French Revolution, with a view of supplanting the vulgar songs then in vogue. He composed the song and the music in one night. It was at first called 'Chant de Guerre de l'Armée du Rhin,' but subsequently received its present name because it was first publicly sung by volunteers from Marseilles in July, 1792. It became the national song of the French republicans, and was soon known through Europe and America. The tune is peculiarly stirring. It was suppressed under the first empire and the Bourbons, but the revolution of 1830 called it up anew, and after being suppressed under the second empire it is again the recognized national anthem of the French.

Marseilles, mär-sälz', or **Marseille,** mär-sā-yĕ, France, the principal commercial seaport of the country, a first-class military and naval station, the second city of France as regards population, and the capital of the department of Bouches-du-Rhône, 508 miles southeast of Paris. It stands on the northeastern shore of the Gulf of Lyons, and on a bay containing a group of islets, one of which, the Château d'If, has world-wide celebrity in connection with the elder Dumas' 'Monte Cristo.' The city is strongly defended by various works, and lies in the form of an amphitheatre round a natural harbor of moderate size (about 70 acres), known as the Old Harbor. The New Harbor consists of a series of extensive docks or basins along the shore to the northwest, with a protecting breakwater in front. From the Old Harbor one of the finest of the city thoroughfares, called the Cannebière, runs inland in a straight line; while at right angles to this another great thoroughfare traverses the city, planted with trees, lined with fine edifices, and bearing different names at different points. In the older part of the town the streets are narrow and irregular, but in general the streets are spacious and regular, and lined with handsome houses. Marseilles, however, is not rich in public edifices. The chief are the large cathedral, in the Byzantine style, consecrated in 1893; the church of Notre Dame de la Garde, a modern Romanesque building, on a hill of same name, whence a splendid view is obtained; the church of St. Victor, a building of great antiquity; the Hôtel de Ville, the Prefecture, the Palais des Arts de Longchamp, containing a picture-gallery and natural history museum; the exchange; the public library (102,000 vols.); the palace of justice or law courts; the episcopal palace, etc. Marseilles is the see of a bishop, and possesses a court of first instance, a mint, an Academy of Sciences, Belles-lettres, and Arts, various learned societies and educational institutions.

Marseilles improved greatly in regard to street architecture, sanitary matters, etc., and made great progress in extent, population, and commerce, largely owing to the conquest of Algeria and the opening of the Suez Canal. Since 1855 some 200 acres have been added to the previous harbor accommodation. From the Durance an abundant water supply has been derived. A canal irrigates the neighboring slopes and plains, and has transformed them from arid tracts into fruitful fields. The surrounding districts are now occupied by a new population, employed in raising vegetables, fruit, etc., on the reclaimed and improved lands.

The most important manufactures are soap, soda, and other chemical products; also olive and other oils, sugar, machinery, iron and brass work, matches, candles, glass, earthenware, oriental hosiery, etc. In the building-docks a great number of war and other vessels are built. The trade consists chiefly of soap, olive-oil, wine, brandy, corn, flour, dried fruits, oranges, and other products of the southern departments; salt provisions, tobacco, wool, skins and hides, iron, raw cotton, cotton twist, dye-woods, and other articles of colonial produce.

Marseilles was founded by a colony of Greeks from Asia Minor about 600 years before Christ, the original name being Massalia, and the Greek language is said to have been spoken here for several centuries before Christ. Its progress for centuries was rapid and almost without interruption. Having taken the part of Pompey in the great contest for supremacy between him and Cæsar, it was besieged by the latter and taken in 49 B.C. On the decline of the Roman Empire it became a prey to the Goths, Burgundians, and Franks. In 735 it fell into the hands of the Saracens, who completely destroyed all the ancient monuments which previous barbarians had spared. In the tenth century it fell under the dominion of the counts of Provence, and for some centuries after followed the fortunes of that house.

Marsh, George Perkins, American scholar and diplomat: b. Woodstock, Vt., 15 March 1801; d. Vallombrosa, Italy, 23 July 1882. He was graduated at Dartmouth in 1820; studied law at Burlington; was elected to the Supreme Executive Council of Vermont in 1834; sat in Congress from 1842 to 1849, when he went to Constantinople as minister for four years; and in 1852 was sent on a special mission to Greece. In 1861, after seven years in the United States, he went to Italy as minister, and held that post until his death. An able English philologist, Marsh wrote 'Lectures on the English Language' (1861), 'The Origin and History of the English Language' (1862), 'Man and Nature,' in which he urged forest planting and forest preservation (1864), etc. He edited Wedgewood's 'Etymology' and translated Rask's 'Icelandic Grammar.' Consult the 'Life and Letters' edited by his widow (1888).

Marsh, Othniel Charles, American palæontologist: b. Lockport, N. Y., 29 Oct. 1831; d. New Haven, Conn., 18 March 1899. He was graduated from Yale in 1860, studied in 1860–2 at the Yale (now the Sheffield) Scientific School, in 1862–5 at the German universities of Berlin, Heidelberg, and Breslau, and from 1866 until his death was the first professor of palæontology at Yale. From 1882 he was vertebrate palæontologist to the United States Geological Survey, his field-work for the survey ceasing in 1892. His investigations in regard to extinct vertebrates are very important, and were declared by Charles Darwin to furnish some of the most satisfactory evidence of the evolutionary theory. He made particular study of the Rocky Mountain region, and from 1868 almost annually organized and conducted expeditions into that district. In these explorations he discovered over 1,000 new fossil vertebrates, of which he classified and described more than one half. Among his discoveries are those of the *Odontornithes*, a sub-class of cretaceous birds, with teeth; the *Dinocerata*, ungulate animals of the Eocene period, elephantine in size; the first known American pterodactyls, or flying lizards; and several new families of dinosaurs. Perhaps he was best known for his study of the primitive horse, the *Eohippus*, *Orohippus*, and *Epihippus*. In 1890–9 he made researches in the geology of the region between the Appalachian range and the Atlantic. He was curator of the geological collection of the Yale museum of natural history in 1867–99, and in 1898 presented to the university his own collections. He was a nephew of George Peabody (q.v.), and it is said to have been at his suggestion that the Peabody Museum at Yale was established. In 1887 he was made honorary curator of vertebrate palæontology in the United States National Museum, and in 1898 received the Cuvier medal of the French Academy of Sciences. He was president of the American Association for the Advancement of Science in 1878, and of the National Academy of Sciences in 1883–95. From a bibliography of 237 titles, these works by him may be cited: 'Odontornithes: A Monograph on the Extinct Toothed Birds of North America' (1880); 'Dinocerata: A Monograph of an Extinct Order of Gigantic Mammals' (1884); and 'The Dinosaurs of North America' (1896). Consult memoir by C. E. Beecher in the 'American Journal of Science,' June 1899.

Marsh, Richard, English novelist. Among his novels, several of which have been reprinted in this country, are 'Mrs. Musgrave and her Husband' (1895); 'The Crime and the Criminal' (1896); 'The Beetle: a Mystery' (1897); 'Tom Ossington's Ghost' (1897); 'Frivolities' (1899); 'Ada Vernham: Actress' (1900).

Marsh, Sylvester, American engineer: b. Campton, N. H., 30 Sept. 1803; d. Concord, N. H., 30 Dec. 1884. In 1826 he established a provision business in Boston, in 1833 in Chicago, and from 1837 was in the grain trade at Chicago. He originated the meat-packing industry and is regarded as one of the founders of Chicago. From 1864 he resided in New Hampshire. On 25 June 1858, he obtained a charter for a railway to the summit of Mount Washington, a project deemed so impossible that he was called «crazy Marsh.» The railway, 2.81 miles long, with an ascent of 3,625 feet, was completed in July 1869. The chief feature in the operation of the road is a central cog-rail. Similar roads were built on the Rigi, Switzerland, and on Green Mount, Mount Desert, Maine.

Marsh Crocodile, or **Muegger,** the common inland crocodile of India, locally venerated by the Hindus, to whom it is known as «Muegger.» It inhabits the tanks and marshes of India and Ceylon; and suitable places westward almost to the Persian coast, and eastward throughout the Malay peninsula and islands. It is dark, olive-brown in general color above, lighter on the ventral surface; the young are paler, with black spots. A specimen 12 feet long is considered large, but instances of a length of 18 feet have been recorded. The head is rough-coated, but has no ridges; the snout is broad, and the teeth number 76. These crocodiles swarm in river-marshes, weedy ponds and artificial reservoirs, throughout their range, feeding on fish and small animals, and little feared by horses, cattle or human beings, for in general they are cowardly and reluctant to attack men or even to resist injury. In case the water of their home dries away, they migrate to other pools; and in seasons of drouth are likely to be met with anywhere wandering in search of water; as a last resort they will bury themselves in the mud and remain in a torpor until revived by the coming of rains. These reptiles display considerable cunning in capturing their food and in avoiding harm, feigning death very cleverly. They are kept in a semi-domesticated condition in many parts of India by pious Hindus, whose priests build temples near the great ponds, protect and feed the reptiles, and imagine the service pleasing to the gods as well as profitable to themselves. Extensive descriptions of the animal and of its worship may be found in the zoological works of Blanford, Jerdon, Tennent, Gadow and others, and in such volumes as Adams' 'Wanderings of a Naturalist in India' (Edinburgh 1867), and Hornaday, 'Two Years in the Jungle' (New York 1885).

Marsh Gas. See METHANE.

Marsh Hare. See HARES.

Marsh Hawk, or **Harrier,** a migratory hawk (*Circus cyaneus*) of medium size, commonly known in one or another of its varieties throughout the north temperate zone, which frequents marshy meadows, where it makes its nest upon the ground in a tussock of grass, and lays five to seven roundish, dirty white eggs. In such places it finds its food, chiefly mice and frogs, and sails slowly back and forth close to the ground watching keenly for movements in the grass and ready to pounce upon its prey. Its wings are long and its flight may be swift and powerful when occasion demands, but it was accounted «ignoble» among falconers. It rarely seizes birds or even young poultry, although one of its names is «hen-harrier,» and should be protected and encouraged by farmers as one of the most useful and persistent mousers. This hawk may be readily recognized by the broad patch of white on the rump displayed by both sexes. The male is dull grayish-blue, in general tint, and the female rusty brown, both streaked with white. Consult Coues, 'Birds of the Northwest' (1874).

Marsh-hen. See MUD-HEN.

Marsh Mallow, a coarse, large-leaved herb (*Althea officinalis*), of the Old World, but naturalized in marshy places along the eastern coast of the United States, which is related to the hollyhocks (q.v.); the flowers are pale rose-color, some in a terminal spike and some axillary. Its root is mucilaginous, and of service as a demulcent in medicine, but it is mainly used as a basis for the confection called «marsh-mallow.» Compare MALLOW.

Marsh-marigold. See COWSLIP.

Marsh-trefoil, a handsome marsh plant. See BUCK-BEAN.

Marsh-wren, either of two species of American wrens that inhabit reedy marshes. They have the diminutive brown bodies, short wings and tails, the latter often held cocked up over the back, awl-like bills and inquisitive activity characteristic of wrens (q.v.) generally. One is the long-billed (*Cistothorus palustris*), most numerous in the salt-marshes along the Atlantic coast; and the other the short-billed, better known about inland lakes and rivers. The former is somewhat the larger, has a decidedly longer bill, and lays eggs dark chocolate in color, while the eggs of the short-billed species are pure white. Both make elaborate nests in the form of ball-like baskets, with a little entrance at the side, woven of leaves of wild rice or marsh grasses, and fastened to the stems of the reeds. A curious habit of the species is that each pair will make several nests each season, only one of which serves the purposes of incubation. These wrens give in the spring an exceedingly pretty chattering song, and when dozens are singing together in a patch of reeds the effect is most pleasing.

Mar'shal, a Federal officer appointed by the President in each judicial district, and corresponding to the sheriff of a county. His duty is to execute all precepts directed to him, issued under the authority of the United States, and is under the jurisdiction of the United States district and circuit courts. Sometimes police officers in American towns are known as marshals. In some European countries the title of marshal confers the highest military distinction, that of Marshal of France being especially prized. The word is derived from the Old High German word *marah,* a horse; and *scalh,* a servant; hence *Marascalh,* a man appointed to take care of horses. The marshal of the German empire derived his origin from the Frankish monarchs, and was equivalent to the *comes stabuli* or *connétable.* He was bound to keep order at the coronation of the emperor, and to provide lodgings for the persons connected with the ceremony. He was called *arch-marshal,* a dignity belonging to the electorate of Saxony. At the coronation it was his duty to bring oats in a silver vessel from a heap in the open market-place, and to present the vessel to the emperor. His duties were discharged by a hereditary marshal (*Erbmarschall*). In Prussia general field-marshal is the highest military honor. In England field-marshal is given as an honorary rank to general officers who may have no immediate command. Marshal also signifies a person who regulates the ceremonies on certain solemn celebrations or, as in the United States, at parades, street processions, etc.

Marshall, mär'shal, **Alfred,** English economist: b. London 26 July 1842. He was educated at St. John's College, Cambridge, and in 1877 was principal of University College, Bristol. In 1883-4 he was lecturer at Balliol College, Oxford, and has been a member of various public boards. He has published: 'Economics of Industry' (1879); 'Principles of Economics' (1890); 'Elements of Economics' (1891); etc.

Marshall, Edward, American journalist: b. Enfield Centre, N. Y., 31 May 1868. He was educated in the public schools at Rochester and entered journalism in New York city, where he conducted an editorial crusade against the conditions existing in tenement buildings. He has been connected with leading New York newspapers and was special correspondent during the Spanish-American war. He has published 'The Rough Riders.'

Marshall, Emma Martin, English novelist: b. North Repps, near Cromer, Norfolk, 29 Sept. 1830; d. Clifton, near Bristol, 4 May 1899. She was married to H. G. Marshall in 1851, and her life thereafter was mainly spent in the cathedral towns of Wells, Exeter, Gloucester, and Bristol. She wrote more than 100 volumes, nearly all of them stories intended mainly, though not entirely, for young people. In spite of their number the even excellence of the tales is remarkable, and they may be called historical pictures rather than historical tales. Her plan was to introduce into each story several historical personages, as secondary characters, the principal figures being imaginary. Her books have had a wide reading in the United States and still continue popular. Among them are: 'Under Salisbury Spire' (1889); 'In the East Country with Sir Thomas Browne'; 'Haunts of Ancient Peace'; 'In the Choir of Westminster Abbey in the Time of Henry Purcell' (1897); 'Under the Dome of St. Paul's' (1898). Consult: B. Marshall, 'Life of Emma Marshall' (1900).

Marshall, Henry Rutgers, American author and architect: b. New York city 22 July 1852. He was graduated at Columbia in 1873, and in 1878 entered practice as an architect. In 1902 he was appointed a member of the Art Commission of the City of New York. Besides contributions to literary, philosophical, and psychological periodicals, he wrote: 'Pain, Pleasure, and Æsthetics' (1894); 'Æsthetic Principles' (1895); and 'Instinct and Reason' (1898).

Marshall, Humphrey, American botanist: b. West Bradford (the present Marshallton), Pa., 10 Oct. 1722; d. there 5 Nov. 1801. He followed the stonemason's trade, but devoted his leisure to astronomy, building a small private observatory, and to natural history. He began the collection and cultivation of the more interesting indigenous plants, and in 1773 established the Marshallton botanical garden, where were assembled trees and herbaceous plants of the United States. For years he was treasurer of Chester County, Pa., and in 1786 he was elected to the American Philosophical Society. His 'Arboretum Americanum,' described as «an Alphabetical Catalogue of Forest Trees and Shrubs, Natives of the American United States» (1785), was translated into several European languages.

Marshall, Humphrey, American politician: b. Westmoreland County, Va., 1756; d. near Frankfort, Ky., 1 July 1841. He joined the Continental army at the outbreak of the Revolution, became captain of Virginia cavalry (1778), in 1780 established himself on a Kentucky plantation, opposed the separation of Kentucky from Virginia, and as a delegate to the Danville convention of 1787 was prominent in defeating the measure. He was also a delegate to the Virginia convention that ratified the Constitution of the United States, and in 1793 was a representative from Woodford County in the Kentucky legislature, where he declared his opposition to the plans for raising in Kentucky troops under General George Rogers Clark for an attack on the Spanish settlements near the mouth of the Mississippi River. From 7 Dec. 1795 to 3 March 1801 he was a Federalist senator in the Congress of the United States, and in 1806 was active in denunciation of Aaron Burr. He represented Franklin County in the Kentucky legislature in 1807-9, and had a dispute with Henry Clay which resulted in a duel in which Clay received a slight wound. He sat again for Franklin County in 1823. He published the first 'History of Kentucky' (1812; rev. ed. 1824).

Marshall, Humphrey, American soldier: b. Frankfort, Ky., 13 Jan. 1812; d. Louisville, Ky., 28 March 1872. He was graduated from the United States Military Academy in 1832, entered the mounted rangers, served in the Black Hawk war (1832), and resigned from the army 30 April 1833. Admitted to the bar in 1833, he practised in Frankfort (1833-4) and Louisville (1834-6), became a lieutenant-colonel of Kentucky militia in 1841, and raised for the Mexican War the first regiment of Kentucky cavalry, of which he was made colonel 9 June 1846. He fought at Buena Vista (22-3 Feb. 1847). From 3 Dec. 1849 to 4 Aug. 1852 he served as a Whig in the 31st and 32d Congresses, in 1852-4 was minister plenipotentiary to China, and from 3 Dec. 1855 to 3 March 1859, was again in Congress, this time as an American, or Know-Nothing. In 1861 he was commissioned a brigadier-general in the Confederate army, with command of the Army of Eastern Kentucky. On 10 Jan. 1862 he was defeated by General Garfield at Middle Creek (Floyd County) in one of the most important of the minor battles of the Civil War. In May 1862 he surprised General J. D. Cox at Princeton, Va., and was thus of much service to Lee through the relief of the Lynchburg and Knoxville railway. Having resigned his commission in 1862, he represented Kentucky in the congress of the Confederate States (1863-5). From 1867 he practised law with much success at Louisville.

Marshall, John, Chief Justice of the United States: b. Germantown (now Midland), Fauquier County, Va., 24 Sept. 1755; d. Philadelphia, 6 July 1835. He was the eldest son of Colonel Thomas Marshall of Westmoreland County, Va., a distinguished officer in the French War and in the War of Independence, and of Mary Keith a member of the well known Randolph family. Thomas Marshall removed from Westmoreland County to Fauquier soon after his marriage; this community was sparsely settled and the educational advantages which he could give his children were meager, consequently he became their earliest teacher and succeeded in imbuing them with his own love of literature and of history. For two years John Marshall had, as tutor, James Thompson of Scotland and he was sent for one year to the academy of the Messrs. Campbell of Westmoreland County, where James Monroe was also a pupil. He had no college training except a few lectures on law and natural philosophy at William and Mary in 1779. He was always fond of field sports and excelled in running, leaping and quoit throwing. He loved the free natural life of the country, and his long tramps through the woods around his father's home, Oak Hill, together with his athletic exercises gave him great strength and agility. At 18 he began the study of law but soon left his studies to enter the Revolutionary army. He was active in endeavoring to enlist men for the service and helped to form and drill a company of volunteers. As a member of his father's regiment he took part in the battle of Great Bridge where he displayed signal valor. In 1776 he became a lieutenant in the 11th Virginia, and the next year was made captain. He served in Virginia, New Jersey, Pennsylvania and New York, always displaying great courage and valor and a cheerful acceptance of hardships and privations. This experience was of untold value to Marshall, it broadened his views and quickened his insight in governmental questions. As he says, he entered the army a Virginian and left it an American. In 1780 during a period of military inactivity he attended a course of law lectures at William and Mary and in 1781, after leaving the army was granted a license and began the practice of law in Fauquier County. The next year he was elected to the Virginia Assembly, and shortly afterward was made a member of the Executive Council. He served his State as legislator during eight sessions. In 1784, although he had then removed his residence to Richmond, he was again elected delegate from Fauquier County, and in 1787 served as member from the County of Henrico. When the city of Richmond was granted a representative in the legislature Marshall had the honor of this office which he held from 1788 to 1791. He was also a member of the Federal Convention which met in 1788 to discuss the ratification of the Constitution of the United States, and it was largely due to his convincing arguments that ratification was carried, as the question was hotly debated and the anti-Constitution party had able and determined representatives. For several years he held no public office and devoted himself entirely to his extensive law practice, but in 1795 was again elected to the legislature. During this session he defended the unpopular «Jay Treaty» with England, and by his overwhelming arguments completely refuted the theory of his opponents that the Executive has no power to negotiate a commercial treaty. Marshall's attitude during his service as legislator toward all questions concerning Federal power demonstrated his increasing belief that a strong central government is necessary to real efficiency. In 1783 he had married Mary Ambler, daughter of Jacqueline Ambler, Treasurer of the State, and soon after his marriage made his permanent home in Richmond. The honors bestowed on him testify to the esteem in which he was held by the State and by the Nation. He refused the Attorney-generalship and the ministry to France, but in 1789 accepted the office of special envoy to France with Charles Cotesworth Pinckney and Elbridge Gerry. This mission related to the indignities which the French had offered the American navy and attempted to adjust the commercial relations between the two countries. It failed on account of the arrogant attitude of France, but «Marshall's dignified correspondence added greatly to the prestige of America,» and on his return he was welcomed with many evidences of approbation from his grateful countrymen. Yielding to the earnest solicitation of Washington he became a candidate for Congress and was elected a member of that body in 1798. In Congress he was the leader of the Administration party and the greatest debater in the house on all constitutional matters. In one of his most noted speeches he defended the action of President Adams in the case of Jonathan Robbins and proved conclusively that this case was a question of executive and not of judicial cognizance. In 1800 he was made secretary of state, and in 1801 appointed Chief Justice of the United States, which office he held until his death in 1835. In 1829 he, like Ex-President Madison and James Monroe, was a member of the Virginia Convention which met to alter the State Constitution, and by his wisdom and moderation did much to prevent radical changes and to thwart the attempts of politicians against the independence of the judiciary. In 1831 his health, hitherto unusually vigorous, began to fail; he underwent a severe surgical operation in Philadelphia and was seemingly restored, but the death of his wife was a great shock and a return of the disease in 1835 proved fatal. He died in Philadelphia, whither he had gone for medical relief, and was buried by the side of his wife in the New-Burying-Ground, now Shockhoe Hill Cemetery, Richmond. The sorrow over the country was deep and widespread, even his bitterest political enemies mourned for the kindly, upright man.

Though somewhat ungainly, Marshall was always dignified in appearance; his tall, loosely-jointed figure gave an impression of freedom, while his finely shaped head and strong penetrating eyes bespoke intelligence and power. Directness and simplicity were his dominant characteristics. He was free from any display of pomp, air of office or studied effect. His unfailing good humor, his benignity, his respect for women, his devotion to wife and family and his well-known reverence for religion made him loved and admired even by those who heartily disliked his political opinions. As chief justice for more than 30 years he rendered numerous decisions which were of prime importance to a nation in process of formation. The faculty which made Marshall invaluable as a jurist was his power of going directly to the core of any matter. No subtleties, no outside issue confused him, his analysis was unerring, his logic incontrovertible; he cared nothing for the graces of rhetoric and made no appeal to the emotions; his power lay in his deep conviction and in his illuminating and progressive argument. At a period when the powers of the Constitution were ill-defined, when our government was experimental, Marshall's decisions in Constitutional and international cases were invaluable factors in forming a well-organized Federal government. «He made the Constitution live, he imparted to it the breath of immortality, and its vigorous life at the present hour is due mainly to the wise interpretation he gave to its provisions during his long term of office.» Marshall was the author of numerous reports and papers, of a history of the colonies, and of a ‹Life of Washington,› a book of small literary merit, but containing a mass of valuable authentic information. Consult: Cooley, ‹Constitutional History of the United States› (1889); Margruder, ‹John Marshall› (1885); Thayer, ‹John Marshall› in ‹Beacon Biographies› series (1901).

Emilie W. McVea,
Of the University of Tennessee.

Marshall, Thomas Riley, American lawyer and politician: b. North Manchester, Ind., 14 March 1854. He was graduated from Wabash College in 1873 receiving the degree of A.B., and was admitted to the Indiana Bar in 1875, practicing his profession at Columbia City. In 1910 he was elected governor of Indiana and in 1912 was chosen by the Democratic National Convention at Baltimore as the candidate of the Democratic party for Vice-President of the United States.

Marshall, Ill., city, county-seat of Clark County; on the Vandalia Line and the Cleveland. C., C., & St. L. R.R.'s; about 122 miles east by south of Springfield and 15 miles west by south of Terre Haute, Ind. It is in an agricultural and stock-raising region. Pop. 2,569.

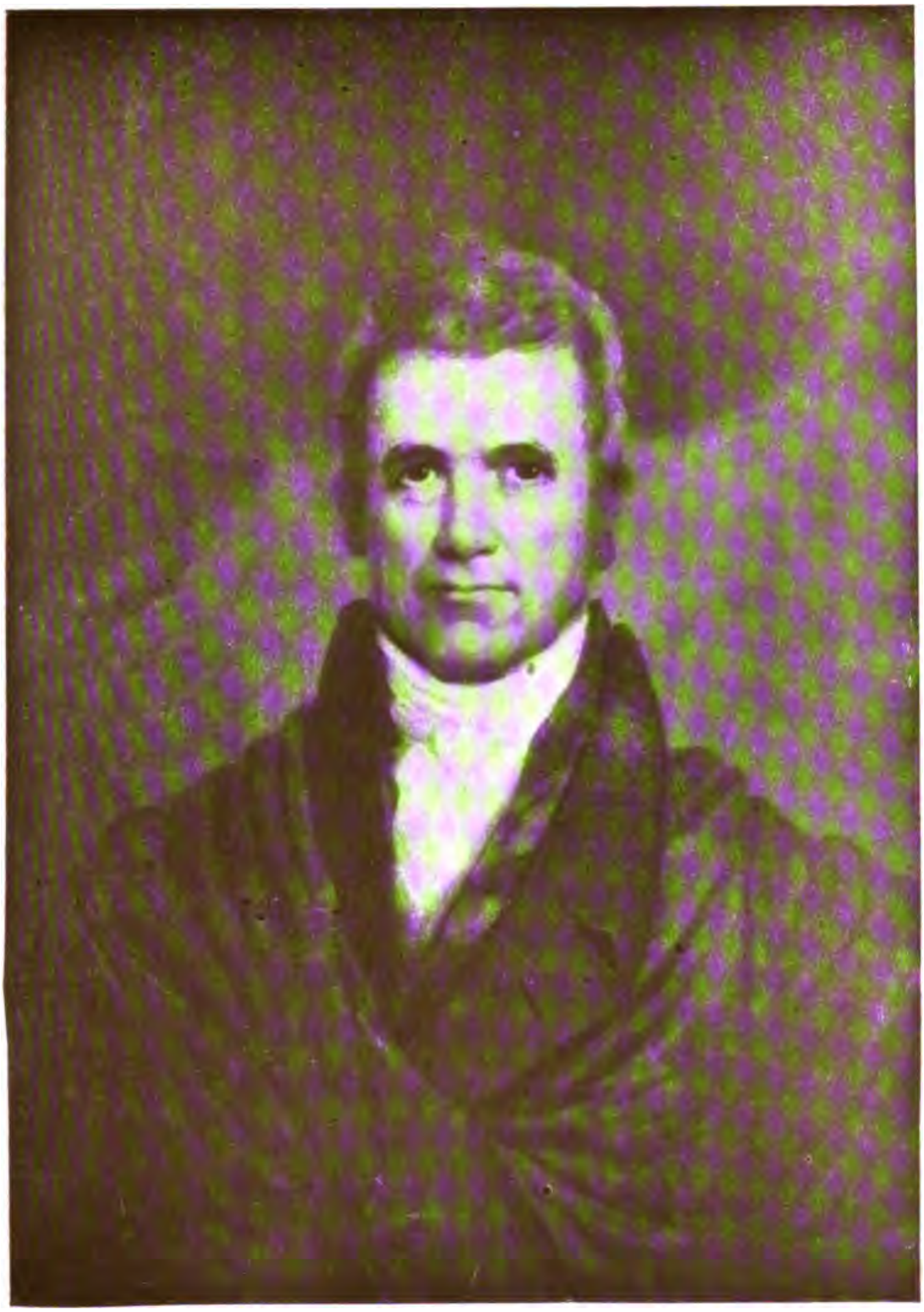
Marshall, Mich., city, county-seat of Calhoun County; on the Kalamazoo River, and on the Michigan C. and on the Cincinnati, J. & M. R.R.'s; about 38 miles south by west of Lansing and 100 miles west of Detroit. The surrounding country is devoted chiefly to agriculture. The principal manufactures are school and church furniture, hot-air furnaces, patent medicines, breakfast food, flour, bicycles, wagons and carriages, windmills, bath-tubs, electrical supplies, caskets, and agricultural implements. Marble and granite works employ a number of men. The grounds of the County Agricultural Society are located in Marshall. Pop. 4,400.

Marshall, Minn., city, county-seat of Lyon County; on the Redwood River, and on the Chicago & N. W. and the Great N. R.R.'s; about 160 miles west by south of Saint Paul. It is in an agricultural section in which wheat is the principal product. The industrial establishments are a flour mill, grain elevators and a creamery. Pop. 2,152.

Marshall, Mo., city, county-seat of Saline County; on the Missouri P. and the Chicago & A. R.R.'s; about 80 miles east of Kansas City. It was settled in 1839 by people from Virginia and Kentucky, and was incorporated as a city in 1866. It is situated in an agricultural region; in the vicinity are valuable deposits of coal and salt, and nearby are stone quarries. The manufactures are lumber, tile and brick, flour, canned goods, creamery products, wagons and carriages. It is the seat of the State Institution for Feeble Minded and Epileptics; the Missouri Valley College (Cumberland Presbyterian), established in 1889; San Saviour Academy (R. C.). There are eight churches and public and parish schools. Marshall has four banks with a combined capital of $300,000. The government is vested in a mayor, city marshal, and a council of six members, who are elected every two years. Pop. (1910) 4,869.

O. P. Sturm,
Editor of ‹Index.›

Marshall, Texas, county-seat of Harrison County, is situated about 14 miles north of Sabine River, 40 miles west of Shreveport and 67 miles south of Texarkana. The city was founded in the year 1840. Marshall is situated in the midst of a fertile agricultural region which has heretofore engaged mostly in cotton raising, but recent developments show that this section is well adapted to truck growing and the raising of fruits, especially peaches, and large orchards are being planted. The city is largely supported, also, by lumber interests, there being large areas of pine timber contiguous to the city, which is rapidly being marketed. The land from which the timber is taken is quickly occupied for agricultural and orchard purposes, some orchards containing as high as 6,000 acres. Stock raising is also carried on, and the city receives considerable support from this source. The Texas & Pacific R.R. runs through the city, west to El Paso, north to Texarkana, and southeast to Shreveport and New Orleans. The Texas Southern R.R. has its terminus, at present, at Marshall, but will be pushed farther south. The shops of the Texas & Pacific R.R., located at Marshall, are the finest to be found anywhere in the southwest. Locomotives and all kinds of rolling stock are manufactured. These shops employ 900 men and have a local pay-roll of $50,000 a month. The local shops and general offices of the Texas Southern R.R.



JOHN MARSHALL,

CHIEF JUSTICE U. S. SUPREME COURT.

are also located in Marshall. Marshall has, in addition to the railroad shops, a 50-ton cottonseed oil mill; a large compress which pressed 45,000 bales of cotton last year. The Marshall car-wheel and foundry plant, located here, is the largest in the southwest, and employs 325 men. There are, also, two wagon factories, a soda-water apparatus factory, and various other minor manufactories. The city has installed complete sewerage and waterworks plants.

Religiously, all the various denominations are represented, and have commodious houses of worship. The school system of the city is run on the latest and best methods, having three ward schools and a centrally located high school, well equipped with teachers and appliances. The public free schools are open nine months in the year. The total value of the city school property is $100,000. There are, also, a number of private schools. There are three Catholic schools in the city — one for girls and one for boys, and an industrial school for boys. In the city are also located Wiley University and Bishop College, institutions for the education of the negroes; the former with 493 and the latter with 500 students annually. The property of the former is valued at $65,000, and the latter at $150,000.

The city has two national banks, the First National, capital $75,000, and the Marshall National, capital $100,000. The Messenger Publishing Co., of Marshall, issues morning and evening daily papers, also a weekly paper and 'The Messenger Monthly Magazine.' Marshall and vicinity is noted for the medicinal properties of its many springs and wells, and many people annually, especially during the summer season, visit these places as health resorts. Hartley's Well, situated within the corporate limits of the city of Marshall, is said to have wonderful curative qualities. Hynson's Iron Mountain Springs, situated five miles west, and the Rosborough Springs, situated nine miles south, are also noted for their health-giving qualities. Pop. (1910) 11,452.

H. T. Lyttleton,
Marshall, Texas.

Marshall Islands, Polynesia, an archipelago in the western Pacific Ocean, belonging to Germany since 1885. They are situated eastward of the Carolines and northward of the Gilbert Islands, and are intersected by the parallel of lat. 10° N. The group consists of two parallel chains, the Ratak group of 15 islands in the east, and the Ralik group of 18 islands in the west; total area, 154 square miles. The islands rise nowhere more than 10 feet above the sea, and are not very fertile, the chief vegetable productions being the cocoanut palm, the breadfruit, and the pandanus. The natives are of a brown color. They are skilful in weaving mats, and in the construction of large canoes. Copra is the only commercial product. Pop. about 16,000.

Mar'shalltown, Iowa, city, county-seat; on the Chicago & N. W., the Chicago G. W., and the Iowa C. R.R.'s; about 70 miles northeast of Des Moines. It was settled in 1860 and in 1863 was incorporated as a town. In 1868 it received a charter as a city of the second class. It is an agricultural and stock-raising region in which wheat and corn are the chief farm products. Some of the industrial plants are flour-mills, grain elevators, glucose factories, meat-packing plants, furniture factories, carriage works, foundry and machine shops, and bottling works. It has the Iowa State Soldiers' Home, Saint Mary's Institute (R. C.), and public and parish schools.

The city is governed on the commission plan. In August, 1911, Iowa had seven cities so governed. These were Burlington, Cedar Rapids, Des Moines, Fort Dodge, Keokuk, Sioux City and Marshalltown. The electric-light plant and the waterworks are owned and operated by the city. Pop. (1910) 13,374.

Marshalsea, mär'shal-sē, a jail in London, attached to the Marshalsea Court, originally established under the earl-marshal of England for the trial of servants of the royal household. Later it was used as a prison for debtors and defaulters, as well as persons convicted of piracy on the high seas. It stood near the church of St. George, Southwark, and existed in the reign of Edward III. It was abolished in 1849. The Marshalsea will be longest remembered as the home of 'Little Dorrit.' Dickens' father was for some time an inmate of the Marshalsea, and in 'Little Dorrit' the novelist has given us a vivid picture of the life of a debtor and his family in this prison.

Marsh'bunker, Marsbunker, etc. See Mossbunker.

Marsh'field, Wis., city in Wood County, on the Wisconsin C., the Chicago, St. P., M. & O., and the Chicago & N. W. R.R.'s; almost in the centre of the State, about 190 miles northwest of Milwaukee. It was settled in 1871 by Louis Rivers, and was incorporated as a village in 1875, and chartered as a city in 1883. It is situated in an agricultural region and near extensive forests. The industries of the city are chiefly connected with manufacturing and farming. The chief industrial establishments are a furniture factory which employs 300 persons; veneer factory, 125; bed and mattress factory, 40; lumber-mills, 50; brick yards, 25; cooperage and excelsior factory, 40; other establishments employing about 30 persons. The city has a fine city-hall, a public library, seven churches, a high school, four public and two parish schools. The two banks have a combined capital of $800,000. The government is vested in a mayor and 12 aldermen, who are elected every two years. About two thirds of the inhabitants are of German descent. Pop. (1890) 3,450; (1900) 5,240. (1910) 5,783.

Adam Paulus,
Editor of 'News.'

Marsh'man, Joshua, English Baptist missionary and Orientalist: b. Westbury, Leigh, Wiltshire, 20 April 1768; d. Serampore, India, 5 Dec. 1837. He was, like his father, a weaver, but had an insatiable thirst for learning, and always kept a book on his loom. Thus he fitted himself to teach in a Baptist school in Bristol; and thence, in 1799, he went to Serampore as a Baptist missionary, and there founded, in 1810, a missionary college. He was an able linguist, and published: 'The Works of Confucius, containing the Original Text' (1809); 'Clavis Sinica' (1814); a Chinese version of the Bible; etc. He co-operated with Carey in the preparation of Telegu version of the Bible, a Bengali-English dictionary, and a Sanskrit grammar. Consult Carey, 'Marshman and Ward' (1864).

Marston Moor, England, in Yorkshire, is celebrated for the defeat there in 1644 of the royal forces under Prince Rupert, by the Parliamentary troops under Fairfax and Cromwell.

Marsu'pial Frog, any of several small tree frogs (*Hylidæ*) of the South American genus *Nototrema,* which incubate their eggs in brood-pouches formed by infoldings of the skin on the back of the female. The eggs are few, of large size, and abundantly provided with food-yolk, and the young sometimes remain in the pouches after hatching until they have completed their metamorphosis and attained considerable growth; but the species vary in this respect. In one case the opening is a longitudinal slit along the middle of the back, with a brood-pouch on each side; but in the other species the double pouch opens cross-ways, near the caudal extremity of the body, and may be closed by a sphincter muscle. About half a dozen species are catalogued, all natives of the forests of tropical America, and none is common or thoroughly well known. Gadow (‘Amphibia and Reptiles,’ 1901) concedes that the best account of them is still that of Weinland in ‘Archive für Anatomie und Physiologie’ for 1854.

Marsupial Mole, a small burrowing marsupial of southern Australia (*Notoryctes typhlops*), called “urquamata” by the natives, which has a remarkable similarity to a true mole in appearance (except its reddish color), adaptations of structure to an underground life, and habits. It feeds upon ants and other insects, and often emerges and travels above ground, though the front feet have been so transformed into digging organs as to make them of little service for walking. It represents a family (*Notoryctidæ*) first described by Stirling in the ‘Transactions’ of the Royal Society of South Australia for 1891.

Marsupia'lia, the marsupial mammals, a group ranked as an order, yet embracing the whole of the superior group *Metatheria* or *Didelphia,* as it has been variously named. The latest investigations, however, tend to invalidate the distinctions upon which these groups were formerly sharply separated from the higher mammals, and to cause the marsupials to be regarded only as an order of *Eutheria* (q.v.), now distinguished chiefly by their extremely local distribution and degenerate non-placental type of reproduction. Their origin was extremely ancient, and its sources are not known; but the group appears to have arisen in Mesozoic times among the earliest of mammalian forms, and to have begun, even before the advent of the Tertiary period, a course of special modification and degeneration, especially in the line which has survived to the present. The former belief that the marsupials stood in the direct line of ancestry of mammals generally, which were thus considered as modified and diversified offshoots from this stock, is no longer held; on the contrary, the marsupials are regarded as a branch from some very early generalized stock, if not a group of independent origin. It is noteworthy, says Woodward (‘Vertebrate Palæontology,’ 1898), that the earliest known complete mammalian skeletons, which pass upward by insensible gradations into undoubted *Eutheria,* are scarcely distinguishable from the skeletons of the more generalized existing marsupials (for example, *Thylacinus*). In the later Mesozoic Age the marsupials were apparently scattered over all the land-area of that time, as their remains have been discovered in many parts of both hemispheres; but even previous to the Eocene epoch they had disappeared entirely from north of the equator. From the first they are divisible into the two branches or sub-orders of *Polyprotodontia* and *Diprotodontia.* The former, characterized by numerous small incisor teeth, includes a majority of the most ancient forms, and such modern groups as the opossums and desyures; while the latter, characterized by only about six upper incisors and two, much enlarged, lower incisors, contain, besides some ancient forms, the majority of modern representations of the order, as the kangaroos, phalangers, wombats, etc.

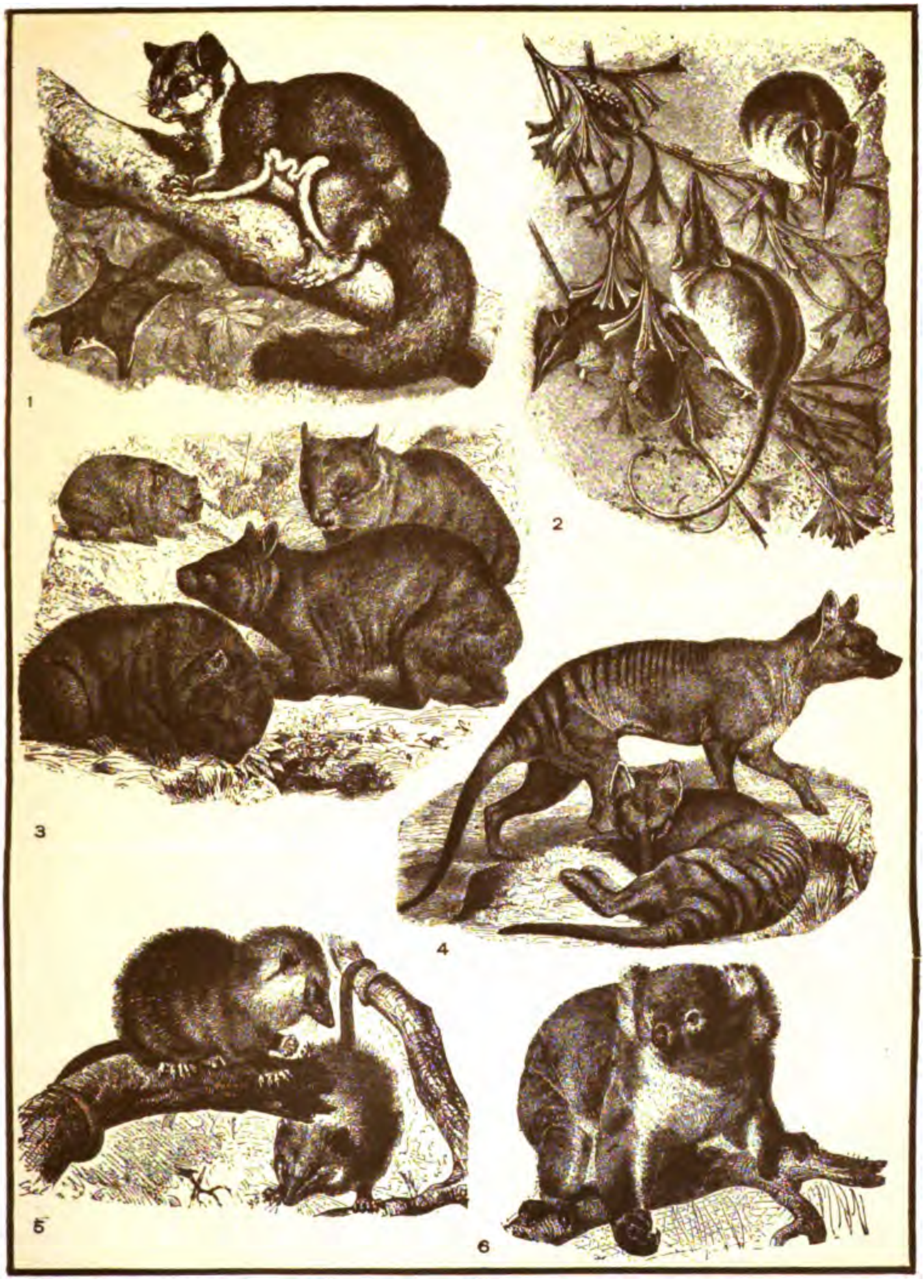
The marsupials take their name from the ventral pouch of skin, covering the mammary glands, in which the young are nourished or protected in most families, and which is indicative of the peculiar method of reproduction characteristic of the order, and for the support of which two bones (the epipubic bones), not present in higher mammals, project forward from the pelvis. The internal organs of reproduction are double, the two oviducts not uniting into a single uterus or vagina, although the separation of the two parts is often imperfect; hence the term *Didelphia* (q.v.). The testes of the male are suspended in a scrotum in front of the penis, the *glans* of which is often double. As a rule no allantoic placenta is present, but there is reason to suppose that the primitive marsupials were placental, and rudiments of this structure persist in the existing Australian bandicoots,—a fact which invalidates the former prime distinction made between the marsupials and higher *Eutheria.*

The young are dropped from the mother's womb as minute, undeveloped fœtuses, those of the largest kangaroos being not half as large as mice when born. These larvæ (for they are that) are then taken by the lips of the mother and placed, one by one, within her ventral pouch, where each is attached to one of her teats, where it clings by means of its temporary sucking-mouth, and is nourished by the milk which oozes or is pressed down its throat. They remain there a length of time varying with the size of the species, until they have grown to an advanced stage of development, when they gradually emerge; but for a long time afterward return to the mother's pouch for refreshment, rest, or safety when alarmed. The pouch varies in its capacity and completeness, in some families being quite absent, so that the young are shielded only by the long hair upon the mother's belly.

While this strange method of reproduction is the most prominent peculiarity of the marsupials, they differ from other orders of mammals in several anatomical features, such as the simplicity of the brain, in which the cerebellum is completely exposed, and the tendency to separation of bones of the skeleton, usually solidly anchylosed in other mammals.

Since early Tertiary times marsupials have been confined to South America and the Australasian region, with the single exception of the few North American opossums (q.v.). This family (*Didelphyidæ*) is restricted to the western hemisphere, and alone remains of the large number

MARSUPIALS.



1. Sugar Squirrel (Belideus sciurues).
2. Mouse-phalanger (Tarsipes rostratus).
3. Wombats (Phascolomys wombat).
4. Tasmanian Wolf (Thylacinus cynocephalus).
5. American Opossum (Didelphys virginiana).
6. Koala (Phascolarctos cinereus).

of Tertiary forms once prevalent in South America, save a single Patagonian diprotodont, the opossum-rat (q.v.). The home of the group, then, is Australia, Tasmania, and the Papuan group, where about 125 species are known; and the race seems to have survived in that insular region owing to the absence of destructive enemies, for most of them are almost defenseless vegetable feeders. They have, however, developed into a great variety of forms under the influence of varying conditions and long competition, and present a most curious parallel to the diversities observable among the higher and more widely diffused mammalia. Some have large size, go in herds, and occupy grassy plains; others are smaller, more agile, and confined to mountainous districts. Others are still smaller, burrow, and feed upon roots, or resemble little terrestrial rodents in appearance and habits; while many forms dwell altogether in trees, and often simulate squirrels of various kinds. In another direction have been evolved a variety of predatory marsupials, whose needs have developed bodies, teeth, and powers resembling those of wolves or bears, and which are wholly flesh-eaters. There is, in fact, hardly a group of mammals which does not find a counterpart among the marsupials,—even the moles and shrews.

The classification of the order divides it into 10 or 12 well-defined families, some of which are wholly extinct, as follows:

POLYPROTODONTIA:

Doubtful primitive forms,—*Triconodon*, Amphitherium, etc.

Didelphyidæ.— Opossums (q.v.).

Dasyuridæ.— Dasyures, Thylacines, etc. (qq.v.).

Peramelidæ.— Bandicoots (q.v.).

Notoryctidæ.—Marsupial Moles (q.v.).

DIPROTODONTIA:

Epanorthidæ; Abderitidæ, etc.— Fossil in the Miocene strata of Patagonia; but surviving in *Cænolestes* (q.v.).

Phalangeridæ.— Phalangers (q.v.).

Diprotodontidæ.— Extinct gigantic phalangers.

Phascolomyidæ.— Wombats (q.v.).

Macropodidæ.— Kangaroos (q.v.).

Consult: Beddard, 'Mammalia' (1901); Thomas, 'British Museum Catalogue of Marsupialia,' etc. (1888); Gould, 'Mammals of Australia' (1863); and scientific works on Australia, especially those of Waterhouse, Aflalo, and Lydekker.

Marsyas, mär'sĭ-ạs, mythological son of Olympos, Œagrus, or Hyagnis. Athena, having seen the reflection of herself in the water, had thrown away the flute which she had invented, displeased because it disfigured the countenance in playing, and had pronounced the severest maledictions against any one who should take it up. Marsyas accidentally found this instrument, on which he soon acquired such skill that he dared to challenge Apollo to a contest, the conditions of which were that the victor should do what he pleased with the vanquished. The Muses, or according to others the Nysæans, were invited to be the umpires. The Muses decided in favor of Apollo, who put to death his rash competitor by binding him to a tree and flaying him alive. In this way was the curse of Athena accomplished.

Martel', Charles. See CHARLES MARTEL.

Martel'lo Towers, so called by corruption from *Mortella*, in Corsica, where a strong tower maintained a determined resistance to a superior English force in 1794. In consequence of the great strength exhibited by this fort the British government erected a number of similar towers round the coast of Great Britain, and especially on the Kentish coast, as a defense against the threatened invasion from France. They are circular, with walls of great thickness, and roofs bomb-proof, and consist of two stories, the lower for the reception of stores, and the upper for the casement of troops. One traversing gun was mounted upon each, in working which the men were secured by the lofty parapet. The ordinary guard was from six to twelve men. Martello towers having come to be considered a failure, were in many places dismantled, but some have received a new and more powerful armament, or have been adapted to the use of the coast guard, or revenue officers. In some instances they are rented to private individuals. Martello towers are still to be found in New Brunswick and Nova Scotia. There are also several on the Gulf of Mexico and one still remains at Kingston, Canada.

Mar'ten, the name of several fur-bearing animals of the weasel family (*Mustelidæ*), which are mainly arboreal in their habits, and do not change their color to white in winter. The common European marten (*Martes*, or *Mustela, foina*), or «fou'mart,» is found in Europe generally, as also is the pine marten (*M. abietum*), although the latter is rarer in Britain. The former breeds in hollow trees, and produces from three to seven young at a birth. They feed on the smaller wild mammals, such as rats, mice, etc., but also attack birds and devour eggs. They are said to be fond of honey, and even to eat fruits and grain. The pine marten occurs chiefly in North America and in the northern parts of Asia. It is of smaller size than the common marten, has a finer fur, and possesses a yellowish mark on the throat. It burrows in the ground, carries the young about six weeks, and brings forth from four to seven in a litter about the end of April. The fur is used for trimmings, and upward of 100,000 of these animals are annually hunted and killed in the fur countries, yet this marten remains fairly numerous. The famous sable marten (*M. sibellina*), which furnishes the highly valuable sable fur, is nearly allied to the pine marten. It inhabits Siberia, and vast numbers of this species are killed annually for the sake of the fur. The pursuit of these animals is described as a task involving much difficulty, discomfort, and even peril. The American sable is furnished by the *M. americana*, and Pennant's marten (*M. canadensis*), or the fisher, pekan or black cat, as it is popularly called among northern hunters, is another well-known species. Both these last named are now almost restricted to the remote Canadian woods, although formerly numerous in the northern part of the United States. Various opinions are held by naturalists as to the specific distinction of several of the species above named, which furnish few very definite characters for separation from one another. Consult Coues, 'Fur-Bearing Animals' (1877).

Martha's Vineyard, Mass., an island off the southern coast, in the County of Dukes. It is separated from the mainland by Nantucket and Vineyard Sounds, from Nantucket Island by Hukeget Channel, and from Elizabeth Islands by Vineyard Sound. It is about 20 miles long and 11 miles across the widest part. The northern coast is high and rocky, with a few indentations, the largest of which is Vineyard Haven. The southern coast is low and irregular, with sand bars and shallow lagoons. On the southwest is Gay Head, 200 feet above the water. A lighthouse is on Gay Head Point. Edgarton, the county-seat, is the principal town on the island. Bartholomew Gosnold discovered and named the island in 1602. The Indians, who then occupied the place, were quiet and friendly, and all became Christians. They remained loyal to the whites even during King Philip's War. The island is a favorite summer resort; annual camp-meetings and summer schools have been held here for a number of years. Pop. of county (1910) 4,504.

Marti, José Julián, ho-sā' hoo-lē-än' mär'tē, Cuban author and patriot: b. Havana 28 Jan. 1853; d. Dos Rios, Cuba, 19 May 1895. He studied in Havana, was sent to the quarries while only a boy as a political suspect, then went to Spain, where in Madrid and Saragossa he studied for the bar and made himself famous for his liberal views, and on his return to America was professor in the University of Guatemala, whence he came to New York city as consul for Uruguay, Paraguay, and Argentina. In 1894 he attempted to land armed men in Cuba, but was intercepted in Florida; in the next year he succeeded in landing, joined Gomez, and was killed in a skirmish with the Spanish at Dos Rios. Marti founded the Cuban organ of independence in New York city, 'La Patria,' was a poet, and wrote a Spanish translation of Helen Hunt Jackson's 'Ramona' (1888).

Martial, mär'shĭ-ạl (MARCUS VALERIUS MARTIALIS), the world's greatest writer of epigrammatic poetry, was born in Bilbilis, Spain, 1 March of one of the years 38 to 41 A.D., and died probably between 102 and 104 A.D. Like his literary friends, the Senecas, Lucan and Quintilian, who also were of Spanish birth, Martial in his writings was thoroughly Roman, and indeed has left us our most valuable picture of contemporary Rome. A Fronto and Flacilla, whom he mentions, may have been his parents, but we know nothing of their origin or station. The grammatical and rhetorical training which his parents secured for him perhaps at Tarraco or Corduba, he half-seriously disparaged as being of no financial advantage, but it was really to his pen that he owed, at least indirectly, his support through life. For, although he was apparently fully equipped for practice at the bar, the profession of an advocate was too exacting to be attractive. On his arrival in Rome, perhaps in 64 A.D., powerful friends launched him on a literary career which rapidly carried his fame even to the limits of the empire. But success as a poet brought him no contentment, since in return for the money, food, clothing, etc., which by flattery and begging he got from imperial courtiers and other men and women of wealth, he had daily to perform social duties that were highly irksome to his indolent nature From the patron's reception at dawn to the end of the latest dinner, he had to dance attendance with wit that should never fail. We find him living at first in humble lodgings on the Quirinal, later in a house of his own on the same hill. A barren farm near Nomentum was his usual refuge from the cares and noises of the capital, but he sometimes made long journeys in Italy, often visiting the country houses of his friends. To his poetical and social talents he also owed political favors from Titus and Domitian. A tribuneship gave him membership in the equestrian order, but probably not the fortune of a knight. He likewise received the coveted privileges to which a father of three children was entitled, the *ius trium liberorum*, though unearned; for the references that have given rise to the theories that he was married from one to three times are not of personal application. It is probable that even Marcella was no more than his patroness. When disgust at the client's life in Rome led him in 98 to return to Bilbilis, this Spanish lady gave him a fine estate. A longing soon seized him, however, to be back in Rome with all its inspirations, a longing never to be gratified; Pliny the Younger, who had helped Martial with a gift of money on his departure from Rome, records the poet's death in Spain. Besides those already named, Juvenal and Silius Italicus should be mentioned as Martial's friends. Noteworthy among contemporaries whose names do not appear in his poems are Tacitus and Statius. The former could have had little sympathy with his character, the latter was no doubt his rival in literary mendicancy. We have 1,575 of Martial's poems. More than half of these are of four lines or less. His earliest book published in 80 contains epigrams describing shows given by the emperor. Then followed books XIII. and XIV. made up of two-line inscriptions for presents at the Saturnalia. The other books (I.—XII.), containing many poems which we should not call epigrams at all, appeared at varying intervals in the period 85–101. Martial's influence in his chosen field has never ceased. A remarkable number of the best epigrams in modern languages are merely adaptations or translations of his poems. His personal character has received general condemnation. Obscenity and servile flattery are the main charges. But in judging even the insincere language that he uses in speaking of the tyrant Domitian we must remember that it went only a step beyond the requirements of formal court etiquette. Kindly critics find in Martial some good points, his modest valuation of his own work, his freedom from envy, his scorn of all hypocrisy, his steady resistance to all temptations to use his powerful weapon of satire in either an unjust or unkind spirit, his tender love of children, humane treatment of slaves and above all his deeply affectionate attachment to his friends.

Literature.— The best text edition of his poems is that of W. M. Lindsay, Oxford, Clarendon Press. The German annotated edition of Friedlaender is invaluable. The only complete prose translation in English, that in the Bohn series, is poor.

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Martial Law, a law that supersedes municipal law, or State law, yet is not a military law.

When in time of extreme peril to the State, either from without or from within, the general safety cannot be trusted to the ordinary administration, or the public welfare demands the adoption and execution of extraordinary measures, it may become necessary to declare the existence of martial law. This is, indeed, no law at all in its ordinary sense; it is in fact the abrogation of it. That which is done under martial law has not an immediate constitutional or legislative sanction, as the military or the statute law, for example, has. Yet remotely and indirectly martial law expresses the will of the people. The Supreme Court of the United States has held that a State legislature may proclaim its existence whenever the public safety demands it; and the Constitution, by implication at least, also permits its proclamation by that clause which provides that the privileges of the writ of *habeas corpus* shall not be suspended, unless when, in cases of rebellion or invasion, their suspension is essential to the general welfare. See also Court-Martial; Law; Military.

Mar'tin, Saint, of Tours: b. about 316; d. about 400. He attended the catechetical school at Pavia. His father was a military tribune, and compelled him in his 16th year to take up arms. He is said to have early escaped from his father and received instruction in a Christian Church. He served under Constantius and Julian, and went to Gaul, where he appeared as the model of all virtue. Among other acts he divided his cloak with a poor man whom he met at the gates of Amiens (Ambianum). The legend says that Christ appeared to him in the following night covered with the half of this cloak. Soon after this vision Martin was baptized, in 337. After living many years in retirement he made a visit to his native place, during which he converted his mother, and opposed with zeal the Arians who prevailed in Illyria. For this he was scourged from the country, on which occasion he manifested the firmness of a martyr. He now established a monastery in Milan, but when he found himself again exposed to persecution took refuge on the Island of Gallinaria, in the Ligurian Sea. He next settled at Poitiers, where he assembled a number of monks, and is said to have wrought many miracles. In the year 375 (according to others 371 or 374) the bishopric of Tours was conferred on him against his will. In order to withdraw himself from the world he built the famous convent of Marmoutiers, between the river Loire and a steep rock. This is regarded as the oldest abbey of France.

Martin, the name of five popes of the Catholic Church, as follows:

Martin I., Saint: b. Todi, Tuscany; d. Cherson, Crimea, 16 Sept. 655. He was elected pope in 649, succeeding Theodore I. He summoned the first Lateran Council at which he caused the doctrine of two wills and operations in Christ to be affirmed. The Emperor Constans II. upholding the doctrines which the Council had condemned, took the pope prisoner and brought him to Constantinople on a charge of treason and then banished him to the Crimea. On account of his sufferings he is numbered among the saints. His day is 12 November.

Martin II., or **Marti'nus I.:** b. Montefiascone; d. Rome 14 Feb. 884. He was elected pope in 882 after the death of John VIII. While bishop of Caere he had been legate for three popes in their negotiations with the East. To English King Alfred he sent a piece of the wood of the Cross.

Martin III., or **Martinus II.:** b. Rome; d. 946. He succeeded Stephen VII. in 942 and was greatly esteemed for his learning and nobility of character.

Martin IV. (Simon de Brion, sē-môṅ dė brē-ôṅ): b. France; d. Perugia 28 March 1285. He succeeded Nicholas III. in 1281, having previously been canon of Tours, and cardinal from 1261. He owed his election in great measure to the influence of Charles of Anjou, whom he supported thereafter and did all in his power to enable that monarch to retain possession of Sicily. In his pontificate occurred the massacre known as 'The Sicilian Vespers.'

Martin V. (Ottone Colonna, ŏt-tō'nā kō-lŏn'nä): b. Rome 1363; d. there 20 Feb. 1431. He was elected pope in 1417, after the abdication of Gregory XII., and the deposition of John XXIII. and Benedict XIII., during the Council of Constance. His first act was to promulgate a bull against the Hussites, remarkable from the circumstance that in it the pope seems to recognize the supreme authority of the councils. He was one of the ablest of the popes, and through his efforts unity was finally secured to the Church and peace to Italy. In 1418 he dissolved the Council of Constance, though a number of difficulties were not then adjusted, and dissensions continued in the Church. Benedict XIII. still lived; and at his death, in 1424, a new anti-pope was elected in Clement VIII., who renounced his pretensions in 1429, when he received the bishopric of Minorca as an indemnification.

Martin, Charles Cyril, American civil engineer: b. Springfield, Pa., 30 Aug. 1831; d. Far Rockaway, N. Y., 11 July 1903. He was educated at Rensselaer Polytechnic, Troy. He was engineer in the Brooklyn navy yard during the Civil War; and afterward chief engineer of Prospect Park, Brooklyn; and was appointed John A. Roebling's second assistant in building the Brooklyn Bridge, of which he became chief engineer after Roebling's retirement.

Martin, François Xavier, American jurist: b. Marseilles, France, 17 March 1764; d. New Orleans 11 Dec. 1846. He emigrated to Martinique when 18; later removed to New Berne, N. C.; taught French there and became a printer; studied law, being admitted to the bar about 1789; and in 1792 was requested by the State legislature to compile the British statutes in force before the Revolution. He was himself a member of the Assembly in 1806–7; was judge of the Mississippi Territory in 1809; went to Louisiana in the same capacity in 1810; and in 1813 became attorney-general of the new State of Louisiana. From 1815 until just before his death Martin was a member of the Supreme Court of the State. Although blind for the last 10 of these 31 years, his ability was not impaired, and it is due to him that the law of the State was in some measure evolved from the tangle of French and Spanish statutes in which he found it. He wrote a 'History of North Carolina' (1829); 'History of Louisiana' (1827), and a version of Pothier on Obligations.

Martin, Helen Faucit, Lady. See Faucit, Helen.

Martin, Henry Austin, American surgeon: b. London 23 July 1824; d. Boston 7 Dec. 1884. He came to the United States at an early age and was graduated from the medical school at Harvard in 1845, when he established a practice in Boston. He served as a surgeon until nearly the close of the Civil War, when he resigned and was brevetted lieutenant-colonel for gallant service. He devoted his attention principally to surgery and to the treatment of smallpox, upon which subject he was a generally recognized authority. He was the originator of many important innovations in the field of surgery and published valuable professional articles in periodicals.

Martin, Homer Dodge, American painter: b. Albany, N. Y., 28 Oct. 1836; d. St. Paul, Minn., 12 Feb. 1897 He was elected a member of the National Academy of Design in 1875; and resided in France in 1882–6. While he was influenced somewhat by the Barbizon School of painters, he developed a style entirely his own, which placed him among the best known of American landscape painters. His works include 'Landscape on the Seine'; 'An Equinoctial Day'; 'Brook in the Woods'; 'In the Adirondacks'; 'Sand Dunes on Lake Ontario'; and 'White Mountains, from Randolph Hill.'

Martin, Josiah, English colonial governor in America: b. probably in Antigua, West Indies, 23 April 1737; d. London, England, July 1786. He rose to the rank of lieutenant-colonel in the British army in 1771, and in the same year was appointed to the royal governorship of North Carolina. He was successful in pacifying the "regulators," many of whom remained zealous Tories; and took a firm and energetic attitude in the maintenance of British authority. But on 24 April 1775 he was compelled to escape to the sloop Cruiser, from which on 8 August he issued a prodigiously long proclamation which the Whigs ordered burnt by the hangman. He was with Sir Peter Parker at Charleston (June 1776), and accompanied Cornwallis into North Carolina after the British victory over Gates at Camden; but in March 1781 withdrew to Long Island, and thence went to England.

Martin, Luther, American lawyer: b. New Brunswick, N. J., 9 Feb. 1748; d. New York 10 July 1826. He was graduated from the College of New Jersey (Princeton) in 1766; studied law at Queenstown, Md., was admitted to the Maryland bar in 1771; in 1774 was one of the commissioners appointed to oppose the claims of Great Britain; in 1778 became attorney-general of Maryland; and in 1787 was a delegate from Maryland to the convention that framed the Constitution of the United States. His opposition to the instrument was so strong that, rather than sign it, he left the convention, thus earning from Jefferson the sobriquet of "the Federal bull-dog." In 1804 he defended Samuel Chase (q.v.) in the latter's impeachment trial before the Senate, and in 1805 resigned his attorney-generalship and resumed private practice. He was counsel for Burr in Burr's trial at Richmond in 1807, in 1814–6 was chief judge of the Baltimore court of oyer and terminer, and in 1818–20 was again attorney-general of Maryland. Among his writings was the series of pamphlets, 'Modern Gratitude' (1801–2). Consult Goddard, 'Luther Martin' (1887).

Martin, Sir Theodore, English lawyer and author: b. Edinburgh 16 Sept. 1816. He was educated at the University of Edinburgh and became a solicitor in Edinburgh in 1840. In 1845 he became a Parliamentary solicitor in London. With Aytoun he published the once famous 'Bon Gualtier Ballads' (1855). His translations comprise many of the works of Goethe, Schiller, Horace, Catullus, etc., and he has written: 'Essays on the Drama'; 'Madonna Pia' (1855); 'Life of Lord Lyndhurst' (1884); 'Life of the Prince Consort' (1875–80); 'Helena Faucit, Lady Martin' (1901).

Martin, William Alexander Parsons, American educator: b. Livonia, Ind., 10 April 1827. He was graduated from the Indiana State University and studied theology. He went to China as a missionary in 1850 and has spent the greater share of his life there engaged in educational and missionary work. He assisted in making the treaty between the United States and China in 1858, and was an authority in China on questions of international law. He was professor and president of Tung Wen College 1868–98, and then president of the New Imperial University until 1900, when it was destroyed in the siege of Peking, in which city he was imprisoned with the American legation. In 1902 he was appointed president of the University of Wuchong. He has edited in Chinese the 'Peking Scientific Magazine,' and the 'Science Monthly,' and has published: 'Siege in Peking' (1900); 'Chinese Legends', 'The Lore of Cathay' (1901), etc.

Martin, a swallow (q.v.). In the United States the name is restricted to the purple martin (q.v.), several other species of which (genus *Progne*) are familiar garden birds in South America. The bank-swallow (q.v.) is sometimes called sand-martin, especially in England, where the term is more generally used as a synonym of "swallow" than in America.

Martineau, mär'tĭ-nō, **Harriet,** English author: b. Norwich 12 June 1802; d. Ambleside 27 June 1876. She was a sister of James Martineau (q.v.). Her first work, 'Devotional Exercises for the Use of Young Persons,' appeared in 1823; and in 1830–1 she won three prizes offered by the Central Unitarian Association for as many essays designed to convert respectively the Catholics, the Jews, and the Mohammedans. "The essays," observes a biographer, "probably converted nobody, but brought in 45 guineas." Next came several stories, mostly intended to inculcate some useful lesson, such as those having the title, 'Illustrations of Political Economy' (1831–4), which were followed by 'Illustrations of Taxation' (1834), and gained an immediate recognition. After a sojourn in the United States (19 Sept. 1834 — 1 Aug. 1836), she published 'Society in America' (1837), intended as a comparison of "the existing state of society in America with the principles on which it is proposedly founded," and 'A Retrospect of Western Travels' (1838), including some criticisms of slavery that were not well received in this country. Up to about 1851 Miss Martineau had been known as a Unitarian, but she now showed a decided leaning towards Positivism, and in 1853 published a condensation of Comte's 'Positive Philosophy.' Among her other works of importance may be mentioned her 'History of England during the Thirty Years' Peace' (1849). During the last twenty years of her life her writings consisted mainly of pamphlets and contributions to newspapers and periodicals. A remarkably candid autobiography which had been written for many years was published after her death (1877). Consult also Miller, 'Harriet Martineau' (1884).

Martineau, James, English Unitarian clergyman and philosopher: b. Norwich 21 April 1805; d. London 11 Jan. 1900. His father, Thomas Martineau, the great-grandson of a Huguenot surgeon who left France after the revocation of the Edict of Nantes, was a manufacturer of bombazines. Harriet Martineau (q.v.) was an elder sister. He was sent to Derby in 1821 to study civil engineering, but in the following year became a student of Manchester College, now at Oxford, then at York. On the completion of his college course in 1827 he took charge for a year of Dr. Lant Carpenter's school in Bristol, and in 1828 he accepted a call to the co-pastorship of Eustace Street Presbyterian Church, Dublin. In 1831 he published 'Hymns for Christian Worship,' and next year resigned his pastorate, but shortly afterward accepted the co-pastorate of Paradise Street Chapel, Liverpool, of which, in 1835, he became sole pastor. In 1836 appeared his first separate original work, 'The Rationale of Religious Inquiry,' which attracted considerable attention. In 1839 he was associated with J. H. Thom and Henry Giles in the defense of Unitarianism against attacks by orthodox clergymen, and of the 13 addresses published in 'Unitarianism Defended' (1839) five were by Martineau. In 1840 he published his collection of 'Hymns for the Christian Church and Home,' and in the same year was appointed professor of mental and moral philosophy and of political economy in his old college, now located in Manchester and named Manchester New College. On the removal of the college to London in 1853 he retained his professorship, but did not settle in London till 1857. In 1848–9 he spent 15 months on the Continent, mostly in Germany, during which his philosophical opinions were profoundly influenced by the study of Greek and German philosophy under Trendelenburg. The remaining publications of his first Liverpool period are an essay on 'The Five Points of Christian Faith' (1841), and the well-known collection of sermons entitled 'Endeavors after the Christian Life' (1843–7). During the period 1849–57, when he was pastor of Hope Street Church, Liverpool, he published many articles in reviews, among them that on 'Mesmeric Atheism,' which finally completed his sister Harriet's estrangement from him. In 1859, being now in London, he and J. J. Taylor, principal of Manchester New College, were chosen joint ministers of Little Portland Street Chapel, but from 1860 till his resignation in 1872 Martineau alone supplied the pulpit. On Taylor's death in 1869 he became principal of the college, a post which he held till his resignation in 1885. In 1866 he was a candidate for the chair of logic and mental philosophy in University College, London, but the united opposition of orthodoxy and secularism led by George Grote managed to defeat him by a single vote. His publications during his connection of 28 years with Manchester New College in London comprise: 'Studies of Christianity' (1869), a volume of sermons; 'Why Dissent?' (1871); 'Hymns of Praise and Prayer' (1873); 'Religion as affected by Modern Materialism' (1874); 'Modern Materialism: Its Attitude towards Theology' (1876), a masterly attack on Tyndall and the scientific materialists; 'Essays, Theological and Philosophical' (1875); 'Hours of Thought on Sacred Things' (1876–80), a collection of the sermons of his maturer period; 'Ideal Substitutes for God Considered' (1880), a criticism of Moral Idealism; 'The Relation between Ethics and Religion' (1882); 'A Study of Spinoza' (1883), his first great philosophical work; and 'Types of Ethical Theory' (1885), the earlier of his two masterpieces. During the remaining years of his life he published his great defense of the essential principles of religion entitled 'A Study of Religion: Its Sources and Contents' (1888); and his freely critical 'Seat of Authority in Religion' (1890); besides a volume of 'Home Prayers with Two Services for Public Worship' (1891), and a collective edition in four vols. of many of his 'Essays, Reviews, and Addresses' (1891). The first academical degree conferred upon him was that of LL.D. by Harvard in 1872, but he received later the degrees of S.T.D. from Leyden (1875), D.D. from Edinburgh (1884), D.C.L. from Oxford (1888), and Litt.D. from Dublin (1892). Martineau was one of the most eminent preachers of his time, but his greatest work was done in the fields of ethics and philosophical theology. At first a necessarian and utilitarian, he was latterly the greatest modern champion of free-will and intuitionalism. In the development of his Christology from a sort of Arianism to complete Humanitarianism, and in his ever-increasing insistence upon the continuity of revelation and the purely internal character of ultimate religious authority, he sums up more than any other the history of Unitarianism, and indeed of liberal theology generally during the 19th century. He was a powerful and eloquent champion of Theism against scientific agnosticism and materialism. All his works are written in a uniquely rhythmic style, characterized by a profuse and happy use of figurative language. Consult Jackson, 'James Martineau: A Biography and a Study' (1900); Sidgwick, 'Lectures on the Ethics of Green, Spencer and Martineau' (1902); Drummond, 'Life and Letters of James Martineau'; and Upton, 'A Survey of Philosophical Work' (1902).

Martinelli, mär-tē-nĕl'lē, **Sebastian**, papal delegate to the United States: b. Lucca, Tuscany, 20 Aug. 1848. He was educated at the College of St. Augustine in Rome and was ordained to the priesthood in 1871. He became superior-general of the Augustinian Order throughout the world and in 1894 was sent to America to visit the monks of that order and shortly afterward was designated apostolic delegate to the United States. In 1896 he was made a special archbishop, and in 1901 was elevated to the cardinalate.

Martinengo-Cesaresco, mär-tē-nĕn'go chä-zä-rĕs'kō, COUNTESS **Evelyn Lilian Hazeldine**

Carrington, Anglo-Italian author: b. England. She was married to the Count Eugenio Martinengo Cesaresco, an Italian writer, and has published 'Essays in the Study of Folk Songs'; 'Italian Characters'; 'The Liberation of Italy'; 'Cavour' in the 'Foreign Statesmen' series; (all these books have been translated into Italian); 'Lombard Studies' (1902); etc.

Martinez, Enriquez, ĕn-rē'kĕth mär tē neth, or **Enrico,** Mexican engineer: b. about 1570; d. in Mexico, 1632. His birthplace is variously given as Germany, Holland, Spain (in Ayamonte, Andalusia), or Mexico. He studied engineering in Spain; went to Mexico as interpreter to the Inquisition and with the title of cosmographer royal; and in 1607 undertook to drain the valley of Mexico, threatened by lakes Zumpango and San Cristobal. His canal was fairly successful but inadequate, and after various experiments on the part of other engineers, with whose work Martinez was accused of tampering, he was bidden enlarge his tunnel and canal. He died before the work was much more than started. Martinez established a printing-press in the City of Mexico, and wrote on the natural history of Mexico, on astronomy, and on trigonometry.

Martinez de Cam'pos, Arsenio. See Campos, Arsenio Martinez.

Martinez de Rozas, Juan, hoo-än' mär tē-nĕth dā rō'zäs, Chilean statesman: b. Mendoza, Argentina, 1759; d. there 3 March 1813. He was educated at Cordova; studied law at Santiago; became professor at San Carlos, Chile, in 1781; in 1787 was made assistant intendant of the province of Concepcion; and in 1796 had risen to the second command in the presidency. He took a prominent part in planning the revolution of 1810; was a member of the governing junta until 1811, when he became its president; and showed himself an able administrator and a brave soldier. Carrera quarreled with him, got the upper hand, and banished him to his birthplace, only a few months before his death.

Martinez, mär-tē'nĕz, Cal., town, county-seat of Contra Costa County; on the Strait of Karquines, and on the Southern Pacific railroad; about 30 miles northeast of San Francisco, and 85 miles southwest of Sacramento. It is near valuable mines and also rich farm lands, on which large quantities of wheat are raised. A novitiate of the Christian Brothers is here, and the Brothers maintain a library which has about 6,000 volumes. Pop. (1910) 2,115.

Martini, mär-tē'nē, **Simone,** Italian painter, sometimes mistakenly called Simone Memmi: b. Siena 1284; d. Avignon 1344. He was the founder of the Sienese school of painting and executed frescoes in the churches of Siena, Assisi, Naples, and Orvieto. At the invitation of Pope Benedict XII. he went to Avignon, and in collaboration with his brother Donato decorated the papal palace. He seems to have aimed at flat decorative effect, rather than artistic boldness and originality in his wall painting, and his color is harmonious and fresh, though his faces are conventional. The large painting of the Madonna on the walls of the Palazzo Pubblico is his most important work at Siena (1315); at Florence is to be seen an 'Annunciation' of his in the Uffizi, and fragments of his work also survive at Avignon. His other more important pictures are 'The Way to Golgotha' (1333) in the Louvre; 'The Blessing of Christ' in the Vatican; 'Christ as a Child with His Parents' in the Royal Institution, Liverpool. Consult: Berenson, 'Central Italian Painters of the Renaissance.'

Martinique, mär-tĭ-nēk', West Indies, an island of the Lesser Antilles, and, except Guadeloupe, the largest in the Caribbean chain. Area, 381 square miles. It is very mountainous (Mt. Pelée, in the northwest, 4,450 feet; Mt. Carbet but a little lower, while a peak near the southern coast rises to the height of 3,950 feet). The thermometer ranges between 76° and 88° F., the summers being hot and dry, autumn and a part of winter hot and rainy, and spring comparatively cool. In 1910 the inhabitants were about 210,000. About 3 per cent were Caucasians, who resided chiefly in St. Pierre; the balance of the population — those who, in the main, suffered least from the disaster of 1902 — are described as negroes, mulattoes, "copre, chabin, and matés" — that is, blends of the African, Carib Indian (q.v.), Mongolian, and French races. A large part of the surface is covered with forests of silk-cotton, species of mahogany, etc. The flora is closely related to that of South America; the fauna abounds in minor reptiles and insects. Of the snake kind the most dreaded is the fer-de-lance, whose bite is fatal. The principal crop is sugar, and in former years about 60,000 tons were produced annually; but the output has fallen to 25,000 or 28,000 tons. Attempts to raise coffee and cacao on a large scale have not been successful. The total foreign trade in 1901 was: exports $5,203,329, and imports $5,394,686. Imports increased by about $300,000 during the 12 months from May 1902 to May 1903. Martinique is a colony of France, sending one senator and one deputy (two deputies until 1903) to the French legislature. Its affairs are administered by a governor and general council. Educational institutions are: a law school at Fort-de-France, several secondary or normal schools, and about 100 primary schools. The island was acquired by the French in 1635. Toward the close of the 18th and beginning of the 19th centuries it was temporarily held by the British. In May 1902 volcanic eruptions from Mt. Pelée destroyed St. Pierre, which was the largest city on the island, with a population of 26,011, and the residents of that place perished, almost without exception; but the statement commonly made, that "a great part of the island was overwhelmed," is incorrect. The scope of Pelée's work was limited. (See Pelée Mont.) About 10,000 persons besides those in St. Pierre lost their lives (in all, 20 per cent of the total population); the best agricultural regions, however, in the south and along the eastern coast, were uninjured. The capital, Fort-de-France (population 22,164) is situated in the southwest, and is important as being the military and naval headquarters and rendezvous in the French Antilles; the terminus of the French transatlantic steamers and West Indian cable system. A statue of the Empress Josephine, who was born in Martinique, is one of the ornaments of the public gardens of Fort-de-France. In 1903 the military force consisted of 1,116 French soldiers. The capital has had its share of misfortunes in the past: it was nearly consumed by fire in 1890, and partially destroyed by an earthquake in 1839.

Marrion Wilcox,
Authority on Spanish America.

Mar'tin's Ferry, Ohio, city, in Belmont County; on the Ohio River, and on the Pennsylvania, the Cleveland, L. & W., the Wheeling B. & T., and the Wheeling & L. E. R.R.'s; almost opposite Wheeling, W. Va. The first settlement was made in 1769 and in 1865, nearly a century later, it was incorporated as a village. The charter under which it is now governed was granted in 1885. It is situated in a region noted for its abundance of bituminous coal, iron, and limestone. The chief manufactures are iron, steel, stoves, shovels, nails, glass, tin, machine-shop products, lumber, barrels, and boxes. The city owns and operates the electric-light plant and the waterworks. Pop. (1890) 6,250; (1900) 7,760; (1910) 9,133.

Martinsburg, mär'tĭnz-bėrg, W. Va., city, county-seat of Berkeley County; on the Cumberland V. and the Baltimore & O. R.R.'s; about 65 miles northwest of Washington, D. C. It is in the vicinity of valuable stone quarries and forests which furnish timber for many mills. The chief manufactures are hosiery, woolen goods, lime, wagons, lumber, and canned goods. The repair shops of the Baltimore & Ohio Railroad and slate and limestone quarries furnish employment for a number of people. The chief buildings are the government building, which cost $100,000; the Berkeley Female Seminary, the Berkeley Female Institute, and the King's Daughters' Hospital. The waterworks are owned and operated by the municipality. Pop. (1910) 10,698. Martinsburg, as the chief city of the lower Shenandoah Valley, on the main road leading across the Potomac, the converging point of several roads, with the Baltimore & Ohio Railroad running through it, was an important point in the military operations of the valley during the Civil War. Then it was in Virginia. Early in July 1861 Gen. Patterson, after a slight skirmish, occupied the place, the Confederates falling back to Winchester. Patterson soon abandoned it, and it was reoccupied by the Confederates. Early in March 1862 it was again occupied by the Union forces under Gen. Banks, the Confederates falling back up the Valley. It was abandoned 25 May 1862, after Banks' defeat at Winchester, but soon reoccupied by Banks. On 8 Sept. 1862 Gen. Julius White was in command of the place with about 2,500 men of all arms. At this time Gen. Lee had crossed the Potomac and was at Frederick, Md. On the 10th Jackson led a column from Frederick, crossed the Potomac at Williamsport, and moved on Martinsburg. White retreated during the night of the 11th to Harper's Ferry. In June 1863, when Ewell's corps moved down the valley on the Gettysburg campaign the place was held by Col. B. F. Smith with 1,200 infantry and a battery. On 13 June Ewell, at Cedarville, detached Jenkins' cavalry brigade and Rodes' infantry division to surround and capture the Union forces at Berryville and Martinsburg. Both garrisons escaped, Smith, with the greater part of his infantry, crossing the Potomac at Shepherdstown and making his way to Maryland Heights. The battery retreated by the Williamsport road, was pursued, and lost five of its six guns, with 200 infantry accompanying it. On 1 July 1864 the place was held by Gen. Sigel with about 3,200 infantry and dismounted cavalry, and a battery. On the 2d Early arrived at Winchester on his campaign to menace Washington and, under Gen. Lee's instructions, first to clear out the lower Valley and wreck the Baltimore & Ohio Railroad. Parties were sent north and west against the railroad, and on the 3d Bradley T. Johnson, with a cavalry brigade, was ordered to move through Smithfield and Lee Town, cross the railroad at Kearnysville, east of Martinsburg, and, pushing north, unite with McCausland at Hainesville beyond Martinsburg. Johnson arrived at Lee Town early in the morning, where he was met by Col. J. A. Mulligan with about 2,000 men and a battery, and after a hard fight was driven back on the divisions of Rodes and Ramseur, which were supporting him. Breckinridge's division, which marched on the main road to Martinsburg, drove before it Stahel's cavalry, on outpost at Darkesville. Sigel, warned of approaching danger, burned his stores, collected his command, and, leaving Martinsburg on the night of the 3d, crossed the Potomac at Shepherdstown and occupied Maryland Heights. Early cleared the Valley and advanced on Washington, and on the 11th Martinsburg was occupied by Sullivan's division of Hunter's command, and remained in Union occupation until the 25th, when Crook, being defeated by Early at Kernstown, was driven through Winchester, made a short stand at Martinsburg, and recrossed the Potomac at Williamsport, Early again occupying the town and destroying the railroad on either side of it, and continuing in possession until 10 August, when, upon Sheridan's advance to Halltown, he abandoned Martinsburg and Winchester and fell back to Strasburg. He advanced from Strasburg on the 17th and reoccupied Martinsburg on the 19th with his cavalry. From this time until 17 September the place was held alternately by Union and Confederate cavalry, on the 17th by Averell's Union division. On that day Early left Winchester with a heavy force of infantry, cavalry, and artillery, and on the 18th attacked and drove Averell from Martinsburg across the Opequon. Sheridan defeated Early on the Opequon on the 19th, and drove him up the Valley; and Martinsburg was again occupied by Union troops, to remain in their possession until the close of the war.

E. A. Carman.

Mar'ty, Martin, Roman Catholic bishop: b. Schwyz, Switzerland, 12 Jan. 1834; d. St. Cloud, Minn., 19 Sept. 1896. He received a collegiate education in Switzerland and Austria, was ordained to the priesthood in 1856 and in 1860 came to the United States. He assisted in the founding of a priory at St. Meinrad's, Ind., and was its first superior; through his efforts the priory became an abbey in 1870 and Marty was raised to the rank of mitred abbot. He resigned his office several years later in order to perform mission work among the Indians of Dakota, over whom he gained a wide influence. He mastered their language and wrote a Sioux grammar and dictionary. In 1880 he became the first bishop of Sioux Falls, and in 1894 was transferred to St. Cloud, Minn.

Martyn, mär'tĭn, **Henry,** English missionary to India: b. Truro, Cornwall, 18 Feb. 1781; d. Tokat, Asia Minor, 16 Oct. 1812. He was graduated from St. John's College, Cambridge, in 1801; became a fellow of the same college in the next year; and, turning from the law, took orders, and landed in India in 1806. After three years at Dinapore he was transferred to Cawnpore, where he opened a church in 1810, in spite of violent opposition, and where he completed a Hindustani version of the New Testament. To perfect a translation of the New Testament into Persian and to recover his health in 1811 he traveled into Persia. In Tabriz he was taken ill with a fever; and on his hurried journey home was compelled to stop at the plague-stricken town of Tokat, where he died. He was the great missionary hero of the Church of England up to the early part of the 19th century. Martyn's works include 'Controversial Tracts on Christianity and Mohammedanism,' and versions of various parts of the Bible into Hindustani, Persian, and Judæo-Persic. Consult the lives by Sargent (1819), Bell (1880), and George Smith (1892); as well as Martyn's 'Journals and Letters' (1837).

Martyn, William Carlos, American Presbyterian clergyman and historical writer: b. New York 15 Dec. 1843. He was graduated from the Union Theological Seminary in 1869, was ordained to the Presbyterian ministry in that year, and has held several important charges, but has devoted his later years to literary work. Since 1897 he has been director of the Abbey Press. He has published: 'Life of John Milton' (1866); 'Pilgrim Fathers of New England' (1870); 'Wendell Phillips — the Agitator' (1890); 'Christian Citizenship' (1896); 'Sour Saints and Sweet Sinners' (1898); etc.

Martyn'ia, a genus of annual and perennial herbs of the order *Pedaliaceæ*, or according to some authors, *Bignaniaceæ*. The ten species have tuber-shaped roots; thick sub-erect stems; opposite or alternate heart-shaped leaves; showy catalpa-like flowers in short terminal racemes; and horned capsules which suggest the names unicorn plant and proboscis-flower. When ripe the capsules split and expose numerous black wrinkled seeds. The stems and foliage are clammy and malodorous, but the flowers of some species not unpleasantly perfumed. The species are all natives of warm parts of America, especially of the lower Mississippi Valley. They are often planted for ornament, as curiosities, and for their capsules, which while young and tender are used as material for pickles. *M. proboscidea*, to which the popular names are generally applied, is the most commonly grown.

Martyr (Greek for "witness"), a designation applied by the Christian Church to those persons in particular who, in the early ages of Christianity, suffered death rather than renounce their faith, and thus testified their confidence in the truth of the new doctrines. Martyrs are sometimes classified as of three classes: martyrs in will and deed, like St. Stephen; those in will, but not in deed, like St. John, who escaped from the death ordained for him by Domitian; and those in deed but not in will, like the Holy Innocents. An account of the life, persecutions, and death of the Christian martyrs is called a martyrology (q.v.). A tomb or oratory erected on the spot where a martyr suffered was called martyrium, martyry. Festivals in honor of the martyrs seem to have been observed as early as the 2d century. The Christians offered prayers at the martyry, and thanked God for the example which they had given to the world. The rite was concluded with the sacrament of the Lord's supper and the distribution of alms. Eulogies were also delivered, and accounts of the lives and actions of the deceased read. These festivals were called the birthdays of the martyrs, because on the day of their death they were born to eternal life.

Martyr, mär'ter, Petėr. See PETER MARTYR.

Mar'tyrology, called also calendar of the saints, the acts of the saints, menology, anology, synaxary, a list of martyrs and other saints, in which was sometimes noted the character of their lives, and in the case of a martyr the place and date of his martyrdom, and the nature of the sufferings which he underwent. Baronius, an ecclesiastical historian of the 16th century, attributes to St. Clement of Rome, almost contemporary with the apostles, the first idea of collecting the acts of the martyrs. In the time of Gregory the Great (end of the 6th century) the Church possessed a general martyrology, the author of which is said to have been St. Jerome, who made use of materials collected by Eusebius of Cæsarea. The only part of it now extant is a catalogue of the martyrs who suffered in Palestine during the last eight years of the persecution of Diocletian. There is a martyrology attributed to Bede (beginning of 8th century), but if not altogether spurious it is at least interpolated. Numerous martyrologies were produced in the next century and subsequently. In 1586, under the auspices of Sixtus V., a martyrology was printed at Rome, with notes by Baronius, with the title of 'Martyrologium Universale.' Ruinart's 'Acta Primorum Martyrum Sincera' appeared at Paris in 1689, and a new edition of it was published in 1859. The 'Acta Sanctorum (q.v.) of the Bollandists comprises over 60 volumes issued at various times from 1643, but the work is still incomplete. The well-known English work of John Foxe, 'The Book of Martyrs,' may also be mentioned.

Marulic, Marko, a Croatian poet and historian: b. Spalato in 1450; d. 1524. After studying at Padua he entered a monastery in Spalato, where he wrote most of the works which stamped him as the foremost of Croatian authors and rendered his name one of the greatest in the literature of Ragusa. Among his works the most noted was 'De Institutione Bene Vivendi,' published in 1511. His poems were republished with a biography (Agram 1869).

Mar'vel, Ik. See MITCHELL, DONALD G.

Mar'vell, Andrew, English poet and satirist: b. Winestead, Holderness, Yorkshire, 31 March 1621; d. London 18 Aug. 1673. He was graduated from Trinity College, Cambridge, in 1638; after activity as poet and tutor became colleague of Milton in the Latin secretaryship in 1637; was three times elected to Parliament for Hull; and under the Restoration attacked Charles II. and advocated a republic. His chief poem is the 'Horatian Ode Upon Cromwell's Return from Ireland' (written 1650; first printed 1776). The shorter poem, 'The Bermudas,' is also well known.

Marvin, Charles Frederick, American meteorologist: b. Putnam, Ohio, 7 Oct. 1858. He was graduated as a mechanical engineer from the Ohio State University in 1883, where he had been instructor in mechanical drawing and laboratory practice since 1879. In 1884 he was appointed to the United States signal service, and later was made professor of meteorology in the weather bureau. He has made many important investigations and discoveries in connection with the weather bureau, and has written quite extensively concerning them.

Marx, mārks, **Karl,** German socialist: b. Trèves 5 May 1818; d. London 14 March 1883. He was educated at the universities of Bonn and Berlin, and in 1842 took up journalism, becoming editor of the ‘Rheinische Zeitung,’ a democratic journal; his socialistic articles in this paper caused its suppression in 1843. Marx then proceeded to Paris, where he became one of the editors of the ‘Deutsch-Französische Jahrbücher,’ to which he contributed articles on the «Hegelian Philosophy of Right.» He was expelled from France in 1845, and retired to Brussels, where he assisted in organizing the German Workingmen's Association, was also active in the organization of the Communist League, and with Engels issued the famous Communist Manifesto in 1847, which was the first public declaration of international socialism. In 1848 Marx returned to Germany, started the ‘Neue Rheinische Zeitung,’ and was active in the revolutionary movements of that year. Banished from Germany in 1849, he went first to Paris, then to London, where he lived till the time of his death. He devoted himself largely to the study of economic questions, and was correspondent of the New York *Tribune* and other papers. In 1864 he took a leading part in the organization of the International Workingmen's Association (q.v.), was selected to formulate its programme, and practically shaped its policy for a number of years; he was also interested in the organization of the German Social Democrats who united with the International in 1869. After 1873 he took no active part in politics, but devoted his time to the completion of his work on capitalism, ‘Das Kapital’ (‘Capital’), the first volume of which had been published in 1867 (English translation, 1886); the second and third volumes were left in MS., and Vol. II. was published in 1885, Vol. III. in 1894, under the editorship of Engel. He also wrote: ‘Zur Kritik der Politischen Oekonomie’ (1859); ‘Lohnarbeit und Kapital’ (English translation, ‘Wage Labor and Capital’); ‘Misère de la Philosophie’ (1847); ‘The 18th Brumaire of Louis Bonaparte’ (1852); ‘Life of Lord Palmerston’ (1850); and ‘Revolution and Counter-Revolution,’ a reprint of a series of letters in the New York *Tribune,* in regard to the revolution of 1848 in Germany.

Marx was undoubtedly the founder of the modern socialistic school, in that he first gave definite scientific statement to the principles of modern socialism. His greatest and best-known work, ‘Das Kapital,’ is a monument of acute reasoning, extensive reading and knowledge, and skilful exposition. In this he analyzes carefully his theory of value, which is that the measure of the value of a commodity is the amount of labor «socially necessary» to produce it, and shows how under the capitalistic system the laborers are exploited of what they produce over and above their wages (surplus value). He also traces the development of capitalistic production, the growth of the working class or proletariat which is finally to transform or revolutionize society, and lays down the principle that the fundamental factor in the development of society is the method of production and exchange; hence the socialist movement must simply assist and hasten the changes in progress. Marx was not only a scholar and thinker, but an organizer and agitator of unusual power. See SOCIALISM. Consult: Aveling, ‘The Student's Marx’; Deville, ‘The People's Marx,’ for epitomes of ‘Capital.’

Maryborough. (1) An Australian town in Talbot co., Victoria, about 100 miles from Melbourne. It contains several factories, machine works, and gold mines. Its railroads are of considerable importance on account of its central geographical position. Pop. about 6,500. (2) Another Australian town in March co., Queensland, about 180 miles N. of Brisbane. It is also a railroad centre and a gold mining region. The other industries are timber, coal, and sugar. Pop. about 15,000.

Ma'ry (in the Greek text *Mariam;* the same as *Miriam*), distinctively known as the Virgin Mary, the mother of Jesus, is described in the gospel history as a virgin in humble circumstances, but of the stem of David, who lived in obscurity in Nazareth, a city of Galilee, and was betrothed to Joseph, a carpenter. A heavenly messenger broke in upon her solitude with a salutation of the deepest veneration. The Virgin was astonished at the appearance: her humility could not account for such a mark of distinction. The angel saluted her as the highly-favored of God, and announced to her that she should bear a son who should be called the Son of God, the long-expected Saviour of the Jews. «How shall this be,» she replied, «seeing I know not a man?» The angel informed her that the power of God should overshadow her, and make that which seemed impossible a reality. She bowed in submission to the will of the Supreme — «Behold the handmaid of the Lord: be it unto me according to thy word.» Her apprehension of her exalted prerogative is shown in the wonderful song of praise and joy into which she bursts at the greeting of her cousin Elizabeth, the mother of John the Baptist, and now called the *Magnificat,* in which she predicts that all generations shall henceforth call her blessed. It was in a stable at Bethlehem, whither she and Joseph had come from Nazareth to be enrolled in the census ordered by the Emperor Augustus, that she gave birth to the Saviour. It was to the stable at Bethlehem that the shepherds, instructed by the angels, came to do homage to the new-born infant; and thither also the Magi, led by the strange star, came to offer Him their gifts. At the wedding of Cana she sought the miraculous powers of her Son to relieve the embarrassment of their hosts occasioned by the want of wine. She attended Him through all his perilous course to Golgotha with ever watchful anxiety, for we find her absorbed in silent sorrow at the foot of the cross with the beloved disciple, St. John. To his care Jesus entrusted her as to a son. She appears for the last time in Scripture in the «upper room» in Jerusalem, praying with the Apostles when the Holy Ghost descends upon them. There is a tradition that she died at Jerusalem 63 A.D.

By the time of the 4th century the religious veneration of Mary had become distinctly marked in the cultus of the Church. From the earliest period she had been spoken of by writers as *theotokos,* or the mother of God. «This term,» says Cardinal Newman, «was familiar to Christians from primitive times, and is used, among other writers, by Origen, Eusebius, St. Alexander, St. Athanasius, St. Ambrose, St. Gregory Nazianzen, St. Gregory Nyssa, and St. Nilus.» Theologians in general began to maintain the opinion as a doctrine of faith, that Mary always remained a virgin, and her perpetual virginity is held both by the Greek and the Roman Catholic Church. A party in Arabia, which regarded her as the actual wife of Joseph and the mother of several children by him, was called in the 4th century *Antidikomarianites,* that is, the adversaries of Mary. At the end of the 4th century Helvidius in Palestine and Bishop Bonosus in Illyria were declared heretics for the avowal of similar opinions. The sentiment of veneration for the Virgin grew fuller and deeper as the Church emerged from the shadow of the persecutions and became the public worship of the Empire. When the teaching of Nestorius, who held that Jesus, the son of Mary, was begotten a mere man, and that the divine nature was afterward added to him, was condemned by the Council of Ephesus in 431, which declared that the divine nature already existed in the son, that was born to Mary, at the time of his birth, and that that son was from the first both God and man, her cultus greatly increased, and in course of time the veneration that was felt for her came to express itself in a more formal devotion. In the 6th century the Christian Church began to celebrate festivals in her honor, of which the Purification, the Annunciation, and the Visitation (the visit of Mary to Elizabeth) are still retained among some Protestant bodies. The Greeks and Roman Catholics observe various feasts besides the above in honor of the Virgin; for instance, the immaculate conception of Mary, her birth, her espousals, and her ascension to heaven; that is, her death and the reception of her body into heaven (in English known as the *Assumption*). Catholics object to the statement that they worship or adore Mary, preferring to use rather such words as veneration, reverence, and devotion. Their veneration in fact has a distinct term applied to it by theologians, namely *hyperdulia,* being higher than that given to saints—*dulia*—and lower than that offered to God alone—*latria.* She is far from being regarded as in any way on an equality with God or her Divine Son. She is but a creature, but she is looked upon as the highest of all creatures, who has been especially honored by God himself in selecting her above all others to be His mother; to her, therefore, is due a special veneration in keeping with her high prerogative. Several religious orders have been instituted in honor of the Virgin Mary, among which are the mendicant order of Servites, and all the orders of females called by her name; for example the nuns of the Conception, of the Annunciation, of the Visitation. In Christian art Mary as the Madonna occupies a most important position, and all the chief events in her life have formed the subject of paintings executed by some of the greatest artists, bearing such titles as the Nativity, Adoration of the Magi, Marriage with Joseph, Flight into Egypt, etc.

Sacred history mentions several other Marys (in the Greek text *Maria*):

1. Mary of Bethany, the sister of Lazarus, the ready disciple and tender worshipper of Jesus, to whom he vouchsafed his peculiar friendship and an imperishable name (Mat. xxvi. 13).

2. Mary of Magdala, or Mary Magdalen, who was cured by Christ of an inveterate disease, and proved her gratitude by the most devoted adherence to him. She served him with her property, attended him on his journeys, and wept at his crucifixion. She was the last to leave his grave, and the first to visit it on the morning of the resurrection, and to behold her risen Lord. See also MAGDALEN.

3. Mary, the sister of the Virgin Mary, supposed by some to be the same with Mary the wife of Clopas (not Cleophas, as in John xix. 25) or Alphæus (another Greek form of the same Aramaic name), and the mother of the Apostle James the Less.

Mary I., queen of England, known popularly as «Bloody Queen Mary»: b. London Feb. 1516; d. there 16 Nov. 1558. She was a daughter of Henry VIII. After the death of her mother, Catharine of Aragon, she was declared illegitimate; but was restored to the succession in 1544. She was bred by her mother in the Roman Catholic faith, on which account she was treated with rigor under Edward VI. She ascended the throne 16 July 1553, after an abortive attempt to set her aside in favor of Lady Jane Grey (q.v.). One of her first measures was the reinstatement of the Roman Catholic prelates superseded in the late reign. Her marriage to Philip II. of Spain, united as it was with a complete restoration of the Catholic worship, produced much discontent. Insurrections broke out under Cave in Devonshire, and Sir Thomas Wyatt in Kent, which, although suppressed, formed sufficient excuses for the imprisonment of the Princess Elizabeth in the Tower, and the execution of Lady Jane Grey and her husband Lord Guilford Dudley. England was now formally declared to be reconciled to the pope; the original laws against heretics were revived, and about 200 perished at the stake, including Cranmer, Latimer, and Ridley (qq.v.). Under Philip's influence a war began with France, which ended in the loss of Calais in 1558, after it had been in the hands of the English for above 200 years. This disgrace told acutely upon Mary's already disordered health, and she died after a reign of five years. Consult the ‹Life› by Strickland in ‹Lives of the Queens of England› (new ed: 1864-5); Lingard, ‹History of England›; Froude, ‹History of England›; Stone, ‹Mary I, Queen of England.›

Mary II., queen of England: b. London 30 April 1662; d. there 28 Dec. 1694. She was the daughter of James, Duke of York, afterward James II. She was married in 1677 to William, prince of Orange, and when the Revolution was effected which dethroned her father, Mary was declared joint-possessor of the throne with her husband, King William, on whom the administration of the government devolved. During the absence of William in Ireland in 1690-1, Mary managed parties at home with extreme prudence, and acted with equal ability as regent in 1693 and 1694. She was strongly attached to the Protestant religion and the Church of England. She endowed William and Mary College, Va., originally intended for the training of missionaries. Consult: Doebner, 'Memoirs and Letters of Mary II., Queen of England'; Marshall, 'Kensington Palace in the Days of Queen Mary.'

Mary of the Incarnation, French-Canadian Ursuline: b. Tours, France, 1599; d. Quebec 1672. Her maiden name was Guyard and in her 18th year she became the wife of M. Martin, but was left a widow with an infant son at 19. She eventually took the veil in the Ursuline Convent at Tours, and in 1639 went to Canada as superior of the convent established at Quebec by Madame de la Peltrie (q.v.). She was extremely successful in administering the school for girls which the Ursulines opened, impressed all with her strong and beautiful personality, which was emphasized by her fine manners and tall stature, and she is one of the most stately and interesting figures in early Canadian history. She wrote an autobiography and her son wrote her life also. Consult: 'Lettres de la vénérable Mère Marie de l'Incarnation' (1681).

Mary Magdalen. See MAGDALEN; also MARY.

Mary Stuart, queen of Scotland: b. Linlithgow Palace 8 Dec. 1542; d. 8 Feb. 1587 at Fotheringay Castle. The only child of James V. of Scotland, she was proclaimed queen upon his death, 14 Dec. 1542, and was crowned 9 Sept. 1543 at Stirling Castle. Negotiations for her hand by the future Edward VI. of England came to nothing in spite of the attempt to effect the betrothal by force of arms. In 1548, having been betrothed to the French Dauphin, she was sent to Paris, where 10 years later she married the Dauphin, who died in 1560 soon after coming to the throne. Mary returned to Scotland, where her French Catholic training and the new Scottish Reformation made her position a hard one. She diplomatically yielded to the force of circumstances and surrounded herself with Protestant advisers. A match between the Scottish queen and Don Carlos of Spain, heir of Philip II., was all but arranged when Mary, in 1565, met Lord Darnley, her cousin, whom she married 29 July 1565. She had hoped to win by this marriage the English Catholics, with whom Darnley had great influence, and to unite all Catholic claims to the English throne, Darnley (see MARGARET TUDOR) being next in succession to Mary; but her husband's weak ambition made him the tool of the Protestant plot against Rizzio, an Italian favorite of the queen, who was killed 9 March 1566, being brutally dragged from Mary's dining-room. Three months later Mary gave birth to a son (later James I. of England). She was temporarily reconciled to Darnley; but on 10 Feb. 1567, Darnley's house was blown up and he was killed. Mary had been in the house late the evening before, and the murder was laid to the Earl of Bothwell, whom Mary married 15 May 1567. This act turned all the nobles against her; she was forced to surrender to her enemies, and 24 July 1567 to abdicate the crown. She was imprisoned in Loch Leven Castle; escaped thence in May 1568; was unsuccessful in her attempt to raise an army; crossed into England, entrusting herself to Elizabeth; and was almost immediately imprisoned. Elizabeth wished to put Mary out of the way, seeing in her a dangerous rival for the English crown, but fear of France and Spain held her back until 1585, while Mary was imprisoned at Tutbury and entrapped into the Babington conspiracy against Elizabeth. Although her complicity was not clearly proved she was beheaded at Fotheringay. The moot point in Mary's tragic history is whether she was a party to Bothwell's assassination of Darnley. That she was, is apparently proved by letters from her to Bothwell, which the Scottish nobles declared they found in Bothwell's jewel-case; but the originals of these letters are not to be found, and their authenticity is doubtful. The matter is ably discussed in Cowan's 'Mary, Queen of Scots' (1901), and Lang's 'The Mystery of Mary Stuart' (1901). The point at issue is, however, confused by making it depend on the authenticity of these letters, for Mary's guilty knowledge of the plot against Darnley seems indubitable. But her career had more than a personal significance since in her person were combined the last hopes of Catholic rule in England, and an intense devotion to Catholicism. Personally she was of a dazzling complexion, apparently her main claim to beauty, marvelously winning, as her early career shows, and clever in argument, as was evidenced nowhere more plainly than in her trial for treason. Consult: Swinburne's sketch in 'Encyclopædia Britannica'; De Peyster, 'Mary Stuart' (1890); Bell, 'Life of Mary, Queen of Scots' (1890); Mignet, 'Histoire de Marie Stuart' (1851); Froude, 'History of England' (1881); Hume, 'Love Affairs of Mary, Queen of Scots' (1903).

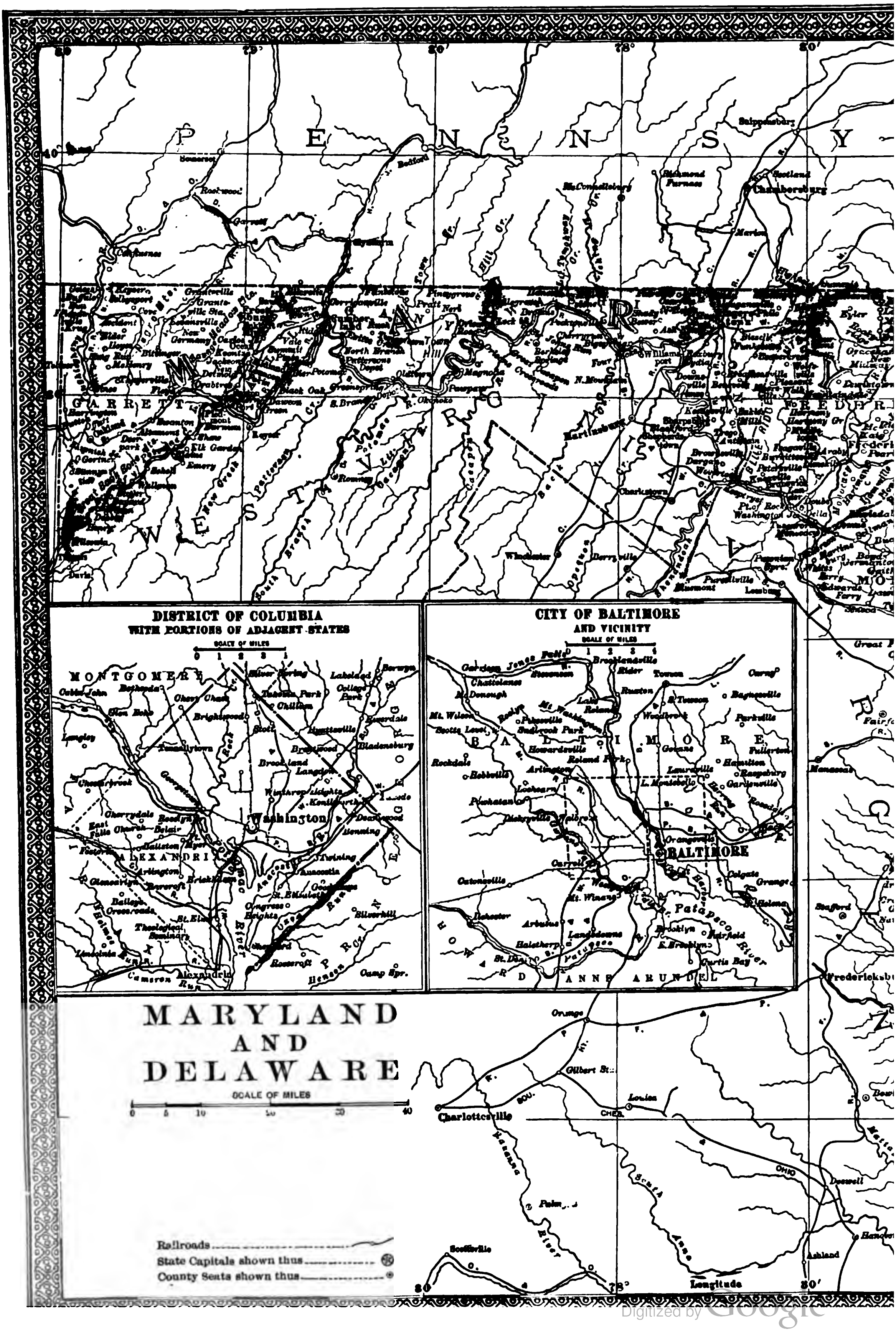
Maryland is one of the 13 Original States and was the seventh to join the Union. It is on the South Atlantic coast, between lat. 37° 53′ and 39° 43′ N., and lon. 75° 4′ and 79° 33′ W. It is bounded on the north by Pennsylvania and Delaware, east by Delaware and the Atlantic Ocean, and south and west by Virginia. The extreme length of the State from east to west is 240 miles; its width from north to south is 125 miles. The total area is 12,210 square miles. Land surface, 9,880 square miles; water surface, 2,350 square miles. The number of incorporated cities, towns, and villages is 98. Population (1910) 1,295,346. Capital, Annapolis. Baltimore is the chief commercial city and financial centre.

Topography.— The most marked physiographic feature of Maryland is its division by the Chesapeake Bay into two unequal parts known as the Eastern and Western Shores. Into this bay many affluents pour their waters. On the Eastern Shore the principal rivers are the Elk, the Sassafras, the Chester, the Choptank, Nanticoke, Wicomico, and Pocomoke; on the Western Shore the Gunpowder, the Patapsco, the South, the Severn, the Patuxent, and the Potomac. At the head of the Bay the Susquehanna River draining a large section of New York and the whole of Central Pennsylvania, brings its tribute of waters gathered from a hundred streams to freshen this inland sea. This body of water exercises a most genial and tempering influence on the climate of the bordering region. The winters are short and rarely severe. The average temperature of this part of the State is in summer 75.5; winter, 36.9; for the year, 55.6. The soil of this section is of a light loam, favorable to the production of all the cereals, and all kinds of fruits and vegetables in great abundance. The average elevation of the land above tide-water of this coastal region is about 50 feet in the lower part, and 100 feet in the upper part of the Eastern Shore; and about 125 feet in the peninsula part of the Western Shore, that is, that part of the State lying between the Chesapeake Bay and the Potomac River. In the central or northern part of the State lying between the upper waters of the Bay and the Blue Ridge Mountains, the elevation is from 300 to 400 feet above tide-water, increasing to 600 and 700 feet, as it stretches from the bay shore to the mountains in the western part of the State. This part of the State is undulating in its surface, is intersected by numerous streams, some of very considerable size, as the Gunpowder, the Patapsco, the Patuxent, the Monocacy, Great Pipe Creek, the Antietam, and the Conococheague. These streams, generally called falls by the early settlers of this region on account of their rapid descent from the uplands, furnish abundant water power for manufacturing purposes. This region is also intersected by several ridges of an elevation of about 800 feet, dividing the country into rich and fertile valleys. This section is traversed by the Blue Ridge range of mountains, some of whose peaks are from 2,000 to 2,400 feet high. The great Appalachian chain passes through the western part of the State, through Allegany and Garrett counties. The highest peak of this range is Backbone Mountain in Garrett County, 3,700 feet high. Other peaks range from 1,500 to 3,500 feet in elevation.

Geology.— The geological formations vary with the surface elevations. The southern section of both the eastern and western shores is alluvial; north of the alluvial deposit is a Tertiary formation; northwest of this come metamorphic rocks; west of them a wide belt of Silurian and Devonian formation; and still farther west Carboniferous strata beginning at Cumberland. In the Tertiary we find marl in abundance: in the metamorphic rocks gneiss, granite, limestone, and iron; in the Carboniferous extensive veins of bituminous coal of the best quality. Over 200 kinds of marble have been found in the State, some of them equal to the Italian marbles.

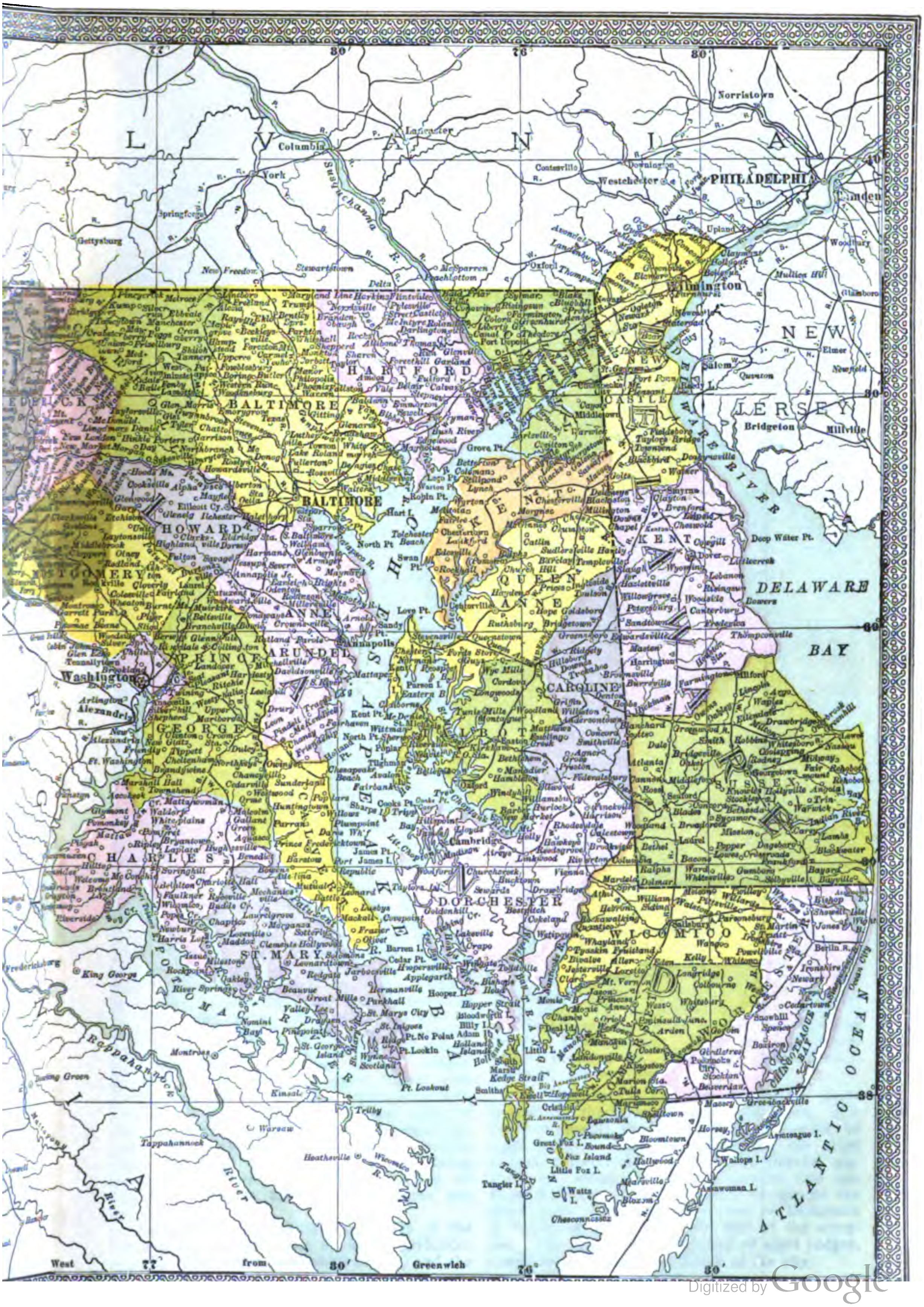
Mineral Resources.— Maryland is rich in mineral resources. Iron ore is extensively distributed throughout the western part of the State, and in the northern part of the Eastern Shore, and is of good quality for casting and other purposes. The iron industry is of early origin. Forges and furnaces were in operation in the colony as early as 1649, and their products were used in the province and sometimes exported to other colonies. Limestone also abounds throughout the middle and western parts of the State, furnishing a valuable fertilizer and an excellent material for roadbeds, for both of which purposes it is extensively used. Clay and kaolin of an excellent quality for bricks, tiles, and water mains and for pottery use, are found in great abundance throughout this region, especially in Harford and Baltimore counties. Baltimore brick ranks high for building purposes in fineness and durability. Of building stone there is a great variety and of superior quality in Maryland. Marble, granite, gneiss and sandstone are found abundantly in Harford, Baltimore, Howard, Carroll, and Montgomery counties. The white marble of Baltimore County is of a high character and reputation for monumental and building purposes, and for more than fifty years has been extensively used for public structures, churches, and private buildings in Washington, Baltimore, and other cities. The monoliths in front of the Capitol at Washington are from these quarries. The noble shaft erected by the nation to the father of his country was constructed almost wholly of this material. There are extensive quarries of granite and gneiss in Harford and Howard counties, which are profitably worked. Variegated marbles of a superior quality and susceptible of a high finish are found in Frederick County. There are immense and almost inexhaustible deposits of coal and iron in Allegany and Garrett counties. The coal is of the rich, semi-bituminous variety, especially valuable for its steam-producing quality. The famous George's Creek Big Vein, 14 feet thick, is located just west of Cumberland. The total value of the mineral product of Maryland, including coal, iron, clay, and building stones, is about $8,600,000. Coal heads the list with a value of $5,000,000; brick and tile follow with a value of $1,400,000.

Agriculture.— In the Colonial period agriculture was the principal employment of the people. Along the shores of the Bay and the rivers emptying into it, plantations were large and were cultivated by slave labor. Tobacco was the staple crop for which there was generally an active demand in the European markets on account of its quality. This led to an extensive commerce for that period, and brought wealth to the planters. Tobacco was for a long time the currency of the Colonies. Debts, dues, and fines were paid in that currency. The constant cultivation of this plant gradually exhausted the soil. The planters took up new land, which, in time, underwent the same process of deterioration. The growth was discouraged. Fertility has been restored to these impoverished soils by the application of guano and other fertilizers; and other kinds of crops are raised, and the average yield of wheat per acre in some sections is as large as the average is in some of the Western States. Tobacco is still cultivated largely, and a State inspection of it is made. But the crops are much more diversified, wheat and corn being the principal ones. In the central and northern parts of the State, the soil is of a clayey nature and very fertile. Carroll, Frederick, and Washington counties contain some of the best farming lands in the United States. The soil is rich, and the yield of wheat and corn per acre is large. The lands in Baltimore, Harford, and Montgomery counties are of the same general character, producing abundantly the same cereals, and also heavy vegetable and fruit crops for the markets and for canning purposes. Their proximity to large cities and the facilities they possess by railroad transportation make vegetable, truck, and dairy farming very profitable. Throughout the coastal region vacant land can be bought at from $5 to $10 and $15 per acre; with improvements farms can be bought for from $20 to $35 per acre. In the central and northern sections there is very little vacant land. But good farming lands in this



MARYLAND AND DELAWARE

Railroads
State Capitals shown thus ⊛
County Seats shown thus ◦


PENNSYLVANIA
NEW JERSEY
VIRGINIA
DELAWARE
PHILADELPHIA
BALTIMORE
Washington
Annapolis
Wilmington
HARTFORD
BALTIMORE
HOWARD
MONTGOMERY
FREDERICK
PRINCE GEORGE
ANNE ARUNDEL
CHARLES
ST. MARY
CALVERT
KENT
QUEEN ANNE
CAROLINE
TALBOT
DORCHESTER
WICOMICO
SOMERSET
WORCESTER
NEW CASTLE
KENT
SUSSEX
CHESAPEAKE BAY
DELAWARE RIVER
DELAWARE BAY
ATLANTIC OCEAN
POTOMAC R.
Susquehanna R.
Rappahannock
77°
30′
76°
30′
40°
30′
39°
30′
38°
West from Greenwich

region can be bought for from $50 to $100 and $125 per acre with improvements. The total number of farms in Maryland (1910) is 48,769. Of this number 33,408 are cultivated by the owners; 14,376 by tenants; 985 by managers. The total value of the farms with buildings is $240,774,000. The average value of land per acre is about $32.28. The amount realized on the large crops in 1900, that is for wheat, corn, oats, rye, buckwheat, etc., was $21,908,730. That from fruit, vegetables, and truck farms (1900) $15,195,629, making a total value of farm products $40,000,000. The value of the buildings in 1910 was $77,751,000, and the value of animals on farms, $30,649,961.

The forest trees are principally pine, chestnut, oak (with three varieties, white, black, and red), hickory, and walnut. The staple fruit crops are peach and apple, which cover many thousands of acres. Maryland peaches, fresh and canned, are exported to all quarters of the country. Tomatoes, melons, small fruits, and all kinds of vegetables are cultivated on the Eastern Shore and sent to the markets of Baltimore, Philadelphia, and New York. The mountains still contain deer; and wild geese and swans are found in large numbers at the proper season on the Bay and its tributaries, as well as woodcock, grouse, partridge, and turkeys. Immense flocks of wild ducks of various species throng the estuaries of the Chesapeake on the approach of cold weather.

Fisheries.— From the earliest period of her history, fisheries attracted the attention of the people of Maryland. Her waters swarm with fish of every variety and oysters and terrapin of superior flavor. The annual value of the sea food, fresh and canned, supplied by the Bay and its tributaries, amounts to $10,020,000. Of this amount oysters alone contribute $3,500,000.

Manufactures.— Maryland by reason of her proximity to the sources of production of the raw material, to the great coal fields, and of the great water-power she possesses in her swiftly flowing streams, her unequaled facilities in water carriage, and her complete railroad connections with every part of the country, engaged early and successfully in manufactures. They embraced nearly every species, textiles, iron and steel, lumber, paper and printing, chemicals, clay, glass and stone, metals, tobacco, clothing, vehicles, shipbuilding of wood, iron, and steel, and hand trades. The manufacturing plants are mostly established in Baltimore, and its vicinity, and the cities of Cumberland, Hagerstown, and Frederick, and the small towns of the central and northern parts of the State. In 1909, the number of manufacturing establishments in the State was 2,502; the capital invested in them was $165,293,000; annual average number of employees, 80,843; value of the finished product, $187,908,000; average annual wages, $41,747,000. In Baltimore alone, there were in 1903, 6,717 manufacturing establishments with a capital of $163,945,811, the annual value of whose product was $164,945,811. In manufacturing industries, Baltimore ranks as seventh among the cities of the United States, being especially prominent in clothing, canning of fruit and vegetables, tobacco manufactures, and iron work.

Shipbuilding.— Living on the shores of the Bay and its estuaries, the ancient Marylander naturally took to boat and shipbuilding, and the fast-sailing clipper ships of Baltimore were, before steam became the main motor power in propelling ships, famous for their swiftness, and carried the flag and commerce of the United States to every part of the world. In 1900, Maryland ranked as the fifth State in shipbuilding. The capital invested in this business was $19,262,193, with a product valued at $10,563,193. There are four large plants engaged in iron and steel shipbuilding in Baltimore and vicinity. A large one recently established at Sparrow's Point, 12 miles from Baltimore, is engaged as well in the manufacture of structural iron and steel. Its products in 1902 amounted in value to $3,299,491, and it gives employment to 2,000 workmen.

Transportation.— The railroad mileage in the State is 1,366.07. The Pennsylvania and Baltimore & Ohio systems own the greater part of it. The first railroad in the United States, and on which the first locomotive was run, was built in 1830 between Baltimore and Ellicott City. The first line of telegraph in the United States was constructed and operated in 1844 between Baltimore and Washington. There are 35 lines of railway, either centring or passing through Baltimore, or directly or indirectly, in connection with other roads, furnishing means of constant and rapid communication and intercourse with all the large cities of the Union and to every section of the country. Sixteen steamship and steamboat lines connect Baltimore with domestic and foreign ports.

Commerce.— The imports of merchandise at the port of Baltimore for 1909 aggregated in value, $24,022,324; and the exports, $77,550,658; giving a revenue in duties of $3,727,015. The principal articles of export were oysters, tobacco, coal, petroleum, grain, sugar, cotton, cattle, and flour.

State Finances.—The net amount of the debt of the State after deducting productive stocks and the sinking fund is $2,616,704.23. The total assessed value of property in 1909 was $820,831,339; of the city of Baltimore, $624,482,590; basis of taxation of the State outside of Baltimore, $196,348,749. The rate of the State tax on 100 is 16 cents. The receipts of the State for the year 1910 amounted to $5,875,598.65; balance in treasury, $1,328,069.66; total, $7,203,668.31; disbursements, $6,328,557.15; cash balance in treasury, $875,111.16.

Government.—The governor is elected for a term of four years, and receives a salary of $4,500 per annum. Legislative sessions are held biennially in even years, beginning on the first Wednesday in January, and are limited in length to 90 days. The Legislature has 27 members in the Senate, and 101 in the House, each of whom receives $5.00 per day. There are 6 Representatives in Congress. The State government is normally Democratic.

The Judiciary.— The judiciary of the State is elective; the term of office is 15 years. The court of appeals, the highest tribunal, consists of eight judges, seven of whom are the chief judges, respectively, of the seven judicial districts into which the State is divided, and one from Baltimore. The governor designates the chief judge. The judicial system of Baltimore is regulated differently from that of the counties. The judiciary is composed of eight judges, constituting the supreme bench of the city.

Religion.— The strongest denominations in the State are Roman Catholic; Methodist Episcopal; Protestant Episcopal; Lutheran, General Synod; African Methodist; Methodist Protestant; Reformed; Methodist Episcopal, South; Presbyterian, North; and Regular Baptist, South. In 1906 there were reported 2,672 Evangelical Sunday Schools, with 32,038 officers and teachers, and 266,471 scholars.

Charities and Correction.— There is a Board of State Aid and Charities appointed by the governor. The State Insane Asylums are at Sykesville and Spring Grove. The State Penitentiary is located at Baltimore; also the House of Refuge for Boys, Saint Mary's Industrial School for Boys, Female House of Refuge, the School for the Blind, and School for the Colored Blind and Deaf, the State House of Correction for minor offenses against the law, located in Anne Arundel County, a State institution for education of the deaf and dumb in Frederick city. The Shepherd Asylum for the Insane, near Baltimore, established by Moses Shepherd.

Education.— In 1694, Governor Nicholson, the second royal Governor appointed by William and Mary, who had assumed the government of the Colony, established at Annapolis King William's College, which after the Revolution was changed into St. John's College, under which name it still exists. In 1750 Rev. Thomas Bacon established a manual training school in Talbot County, believed to be the first of the kind in the United States. In 1770 Eden Hall School was founded in Worcester County, and in 1784 Cokesbury College, under the patronage of the Methodist denomination, was established in Cecil County. In 1774, Charlotte Hall School was established under State authority, and still is a beneficiary of the State. In 1784, Washington College was founded at Chestertown, Kent County. The Western Maryland College for the education of the youth of both sexes was established in 1868 in Westminster, Carroll County. It receives an annual donation from the State of $1,800. Under a series of acts of the General Assembly of the State, passed from time to time in compliance with the requirements of Art. VIII. of the Constitution of 1867, there has been gradually evolved the present excellent and uniform system of free public schools, with a State superintendent at its head, throughout the State, maintained by an adequate revenue raised by general taxation. In 1909 the expenditure for this purpose was $3,934,413.20.

The fund thus raised is distributed by the comptroller among the counties and city of Baltimore, according to population. By an act passed in 1896, books for the pupils of the public schools are furnished free, and an annual tax is levied to meet this expenditure, which is $150,000. Colored schools are maintained throughout the State at the public expense, and they share in the distribution of the school fund equally with the whites. In 1909, there were 2,477 schools in the State and 107 in Baltimore.

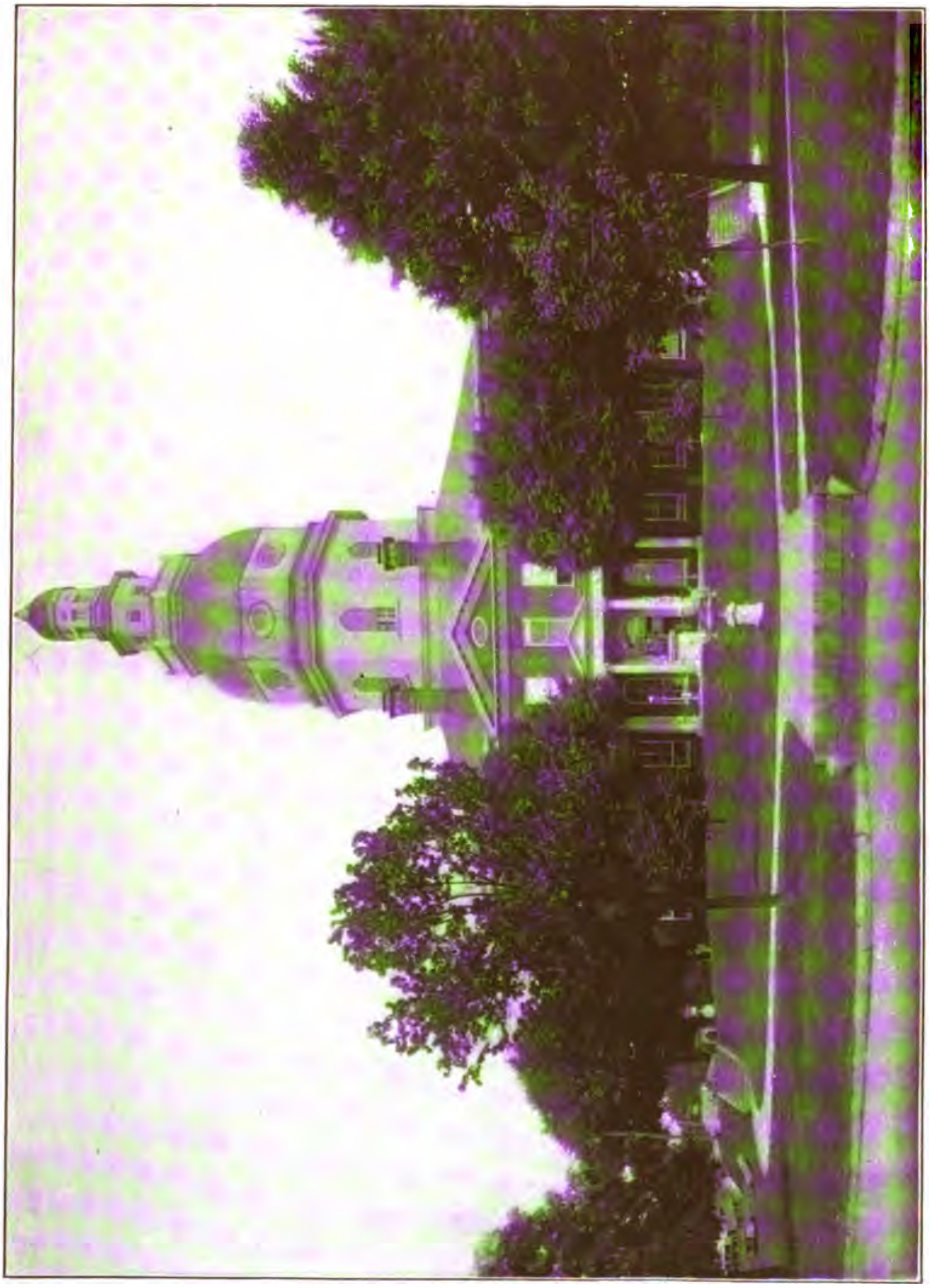
The Maryland Agricultural College, under the patronage of the State, is located in Prince George's County. While especially established for the education of youth in scientific agriculture, it gives tuition in other branches of knowledge, and in some of the mechanic arts. Attached to it is an experimental farm conducted on a large scale. It has an annual donation of $9,000 from the State. There is also an agricultural school for colored youth, supported in part by the State.

The public school system of the city of Baltimore is separate and distinct from that of the State. It was begun in 1829 with two schools, three teachers, and 269 pupils maintained by a system of local municipal taxation. In 1909, there were 107 schools in Baltimore, of which 20 were for colored pupils; 1,778 teachers and 89,995 pupils; of these, 10,000 were colored pupils. The amount of expenditure for the support of these schools in 1909 was $1,754,974.04. In connection with this system of public schools in Baltimore is a high school or college for advanced pupils, which is authorized to confer academic degrees upon its graduates, and two female high schools, a polytechnic or manual training school, and a kindergarten and a female high school for colored children. The Woman's College of Baltimore City for the instruction of women in the higher branches of learning, established by Rev. John Goucher of the Methodist Church, commands a clientele from nearly every State in the Union. There are in Baltimore four medical schools with hospitals attached; one homœopathic institute, three law schools, and one dental college. Besides these public institutions there are in Baltimore and in several of the counties of the State private academies of high character and excellence for the education of youth of both sexes, conducted by masters of experience and learning. In 1886 the late Enoch Pratt established in Baltimore the Enoch Pratt Free Library with an endowment of $1,058,000. The Mercantile Library is supported by private subscription. The Maryland Historical Society founded in 1844, has a large library attached to it, especially valuable to students of history.

The existing system of public schools was inaugurated under the provisions of the new city charter, adopted in 1898, and is under the control of a board of school commissioners appointed by the mayor and city council. The board selects the superintendent.

Higher Education.— From 1690, the date of an event known in Maryland history as the Protestant revolution, by which the government of the colony was taken out of the hands of the Proprietary and transferred to the king of England, to the American Revolution of 1776, the instruction of Catholic youth by Catholic teachers was prohibited in Maryland by severe penalties. Catholic parents of wealth sent their sons and daughters to France or to the Netherlands for their education; those who could not afford to do this had to content themselves with tutors in their families. The Jesuit missionaries had secretly maintained, notwithstanding the prohibition against them, two schools for boys, one at Whitemarsh, Charles County, and one at Bohemia Manor in Cecil County. The American Revolution emancipated the Catholics of Maryland from the disabilities imposed by these intolerant laws. They were now free to educate their offspring without fear of fine or of forfeiture of property. The Reverend John Carroll, the first archbishop of Baltimore, at once devoted himself to provide for the educational wants not only of the Catholics, but of all others who should choose to avail themselves of the institutions he

MARYLAND.



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STATE CAPITOL AT ANNAPOLIS.

established. In this work he had the good fortune to secure valuable aid from an unexpected quarter. The French Revolution had driven into exile a large number of ecclesiastics of the Roman Catholic faith. Many of these had taken refuge in southern Maryland, where they found homes in the Catholic families resident in that part of the State. These gentlemen the Archbishop of Baltimore called to his assistance in this work. Rev. John Dubourg, afterward Archbishop of New Orleans, and of Besançon, France, became president of Georgetown University, founded in 1789, Rev. Francis Nagot, who, on his voyage to this country, had as a companion the celebrated Chateaubriand, became president of St. Mary's College, founded in Baltimore in 1791, and the Rev. John Dubois, afterward first Archbishop of New York, became president of Mt. St. Mary's College, founded near Emmitsburg, Maryland, 1808. Associated with these distinguished ecclesiastics and scholars as professors in these institutions were several of their compatriots and fellow exiles. These gentlemen gave to these seats of learning a distinguished reputation which attracted a great number of students from other States and from other countries. They imparted not only a knowledge of the arts and sciences, but a culture and refinement which left an indelible impression on those who had the good fortune of receiving their instructions. These institutions still remain and carry on the work so auspiciously begun. St. John's Literary Institution was established in Frederick in 1830 by Rev. John McElroy, S. J., and was largely patronized. In 1852, Loyola College was founded in Baltimore by the Jesuits, an order which has a world-wide fame as educators of youth «in virtue and learning,» to quote the language of an Act of the Colonial Assembly of 1671.

The celebrated Mrs. Eliza Seton, foundress of the Sisters of Charity in the United States, established a school near Emmitsburg for the education of women, in 1809. The Order of the Visitation established female schools in Georgetown, Baltimore, and Frederick; the Carmelites in Baltimore, and the Sisters of Notre Dame in Baltimore City and Baltimore County. The Christian Brothers began their great work in primary education in Baltimore, 1845. In 1875, Johns Hopkins University, named after its munificent founder, John Hopkins, was established in Baltimore. Though the youngest of our great universities, it has attained a distinguished rank among the great seats of learning of our country, and enjoys a high reputation abroad. The Johns Hopkins Hospital, connected with the Johns Hopkins University, is the medical department of that institution. It was endowed by the same generous benefactor. It is located in the eastern section of Baltimore, and the buildings cover several acres of ground. The members of its faculty occupy a high rank in the medical profession for their scientific attainments and experimental knowledge. In 1867 George Peabody founded in Baltimore the Peabody Institute, Library, and Conservatory of Music. The library furnishes unequaled facilities to students and scholars in the prosecution of original investigation. The Maryland Institute for the promotion of the mechanic arts was established in Baltimore in 1847.

Provincial History.—Maryland was settled by a body of Englishmen under the auspices of Cecilius Calvert, the second Lord Baltimore and the first Lord Proprietary of the Province, under a charter granted to him by Charles I. on 20 June 1632. The charter was originally intended to be granted to Sir George Calvert, the first Lord Baltimore, and father of Cecilius; but that nobleman dying on 15 April 1632, after the charter had been drawn up, but before it passed the great seal, it was issued to Cecilius, his eldest son, the heir to his title and estates, and also to his schemes of colonization in America. In deference to the request of the king the name of Terra Mariæ, the land of Mary, was given to the province, after the name of his queen, Henrietta Maria, the daughter of Henry IV. of France. Sir George Calvert (q.v.), as the author of the charter, and the projector of the Province of Maryland, may be regarded as its real founder. When he arrived in Virginia he had reason to anticipate a civil, if not a cordial, reception from the authorities and people of the colony on the brief visit he proposed making. He was promptly met by a Dr. Pott, who, in the absence of the Governor, Sir John Harvey, was acting in that capacity, and the council, with a tender of the oath of supremacy, which as a Catholic he could not take, and which it was known he could not take, and which they had no authority to require of him. He declined to take the oath, and leaving Lady Baltimore and his family in Virginia, he sailed for England. On his arrival he applied for a charter and a grant of land north of the Potomac. The application was successful notwithstanding the opposition of the agents of Virginia in London, among whom was William Claiborne, of whom we are to hear more directly. But before the charter passed the great seal, Sir George Calvert, the first Lord Baltimore, died, leaving his eldest son, Cecilius Calvert (q.v.) his heir and who was to become first Lord Proprietary of the Province of Maryland. Cecilius zealously proceeded to execute his father's wishes and to carry out his plans for colonization under the charter. In this he was greatly delayed and hampered by the agents of the Virginia colony in London. They insisted on their objections to the charter, but on appeal to the Lords Commissioners of Plantations, that body in July 1633 overruled the objections and decided in Lord Baltimore's favor, and recommended to both parties the cultivation of friendly relations and good correspondence between them. This recommendation Cecilius Calvert always evinced, both by his instructions to the governor and authorities of his Province, and in his own conduct, a desire to pursue; but his efforts in that direction met with no response on the part of the Virginia colonists.

The main and principal objection urged by the Virginians to the Baltimore Charter was that it was an invasion of their chartered rights. At the time of the grant of the Maryland charter, Virginia had no chartered rights. The charter of the London or Virginia Company had been vacated and annulled by a judgment of the King's Bench on a quo warranto proceeding, instituted for that purpose, in 1624, eight years before the Baltimore grant was issued. Their objection on this ground was therefore wholly untenable. For, whatever may be said of the merits or demerits of that judgment, its legal effect to invest in the crown all right and title to the land granted in that charter to the company, and all civil and political authority and jurisdiction conferred on the corporation, could not be questioned. Virginia thenceforth became a royal colony, and the right of the crown to carve out of the territory, thus resumed, any grants of land it chose to make, and to invest the grantees with any civil or political authority it chose to bestow, could not be questioned. The judgment being that of the highest court in England was final and conclusive.

Nor were the inhabitants of Virginia at the time ill pleased with being relieved by that judgment of a government by a corporation, and erected into a royal colony. In 1643, when the question of a restoration of the charter of 1609 was agitated, the House of Burgesses of Virginia unanimously adopted and sent to the Committee on Plantations of the Privy Council an earnest remonstrance against the proposal, and nothing more was heard of it.

The boundaries of Maryland as laid down in the charter are as follows: Beginning at a point on the Eastern Shore of the Chesapeake Bay, known as Watkins Point, and running thence easterly to the ocean; then by the ocean and Delaware Bay unto the fortieth parallel of latitude; thence by that parallel west to the true meridian of the first fountain of the Potomac; thence verging toward the south unto the farther bank of the said river, and following the same on the west and south to the mouth of said river; and thence across the bay to the place of beginning. On comparing the boundaries set forth in the charter with the present limits of the State, it will be seen that Maryland has suffered a very considerable curtailment of the territory granted by the charter. The charter limits embraced the present State of Delaware, a strip of southern Pennsylvania 15 miles in width and 150 miles in length, embracing the site of Philadelphia; and the valley between the north and south branches of the Potomac River; constituting an area equal in extent to one third of the existing territorial area of the State. Against these flagrant encroachments on their territory both on the north and the south, Cecilius Calvert and his son and successor, Charles, offered strong but ineffectual protest and resistances, owing to the disturbed condition of the colony during the greater part of their proprietaryship. The controversy with the Penns in regard to the northern boundary of the province — the 40th parallel of latitude, according to the Baltimore charter — was of long standing, and led to much acrimony between the parties to it, and to actual, but bloodless, conflicts between the inhabitants on the border of the two provinces, Maryland and Pennsylvania. In these conflicts Col. Thomas Cresap, the noted Indian fighter and Revolutionary officer, figured conspicuously on the part of Maryland. The controversy was finally settled in 1762 by a decree of Lord Chancellor Hardwicke in the case of Penn *v.* Baltimore, under which the present boundary line between these States was run and marked by two English surveyors, Charles Mason and Jeremiah Dixon. This line, known as Mason and Dixon's line, subsequently became famous in our political annals as the dividing line between the free and the slave States.

In 1852, the General Assembly of Maryland passed an Act conceding to Virginia all her right and title to the territory between the north and south branches of the Potomac. In 1877, a joint commission, appointed by Maryland and Virginia, determined the boundary line on the south between these States to be the Virginia or farther shore of the Potomac River at low-water mark; thus conceding the whole river to Maryland as her charter prescribed. The controversy concerning the strip of territory on the western frontier is still open and pending in the Supreme Court of the United States, between Maryland and West Virginia. Of the territory thus granted, the Lords Baltimore were created true and absolute Lords Proprietaries; they were invested with all the regal rights, jurisdictions, prerogatives, privileges, and franchises ever held or exercised by a bishop of Durham in the county of Durham. The Lord Proprietary could establish courts, appoint judges and all the executive officers of the Province from the governor to the constable of the hundred; establish ports; erect manors, and confer on the grantees the manorial rights recognized by English law, including the authority to hold courts baron and courts leet; could coin money; could appoint the members of the Governor's Council, which in time became the upper House of the General Assembly; could initiate all rules and ordinances for the government of the colony. Writs and indictments were in his name; he could pardon all crimes save treason. It was in the opinion of historians the most extensive grant of powers and jurisdiction that ever emanated from the English Crown, and made the Proprietary a quasi-sovereign within his domain. It was the grant of a palatinate. The charter was also a constitution of government securing to the colonists their rights as Englishmen.

Cecilius Calvert went zealously to work at once and organized an expedition consisting of about 300 persons, mostly Roman Catholics with their families and servants, and a considerable body of artisans and laborers. The expedition sailed from Cowes on board the Ark and Dove, on 22 Nov. 1633, being St. Cecilia's day. Two Jesuit missionaries, Fathers Andrew White and John Altham, accompanied the expedition. After a perilous voyage of four months, the colonists reached the mouth of the Potomac, and landed on an island they named Saint Clements, on 25 March 1634, the feast of the Annunciation of the Blessed Virgin Mary, and, according to the method of reckoning time then prevailing, the first day of the New Year. They erected a rude cross, and the Jesuit Fathers celebrated mass, and in the name of the King and of the Lord Proprietary, the colonists took possession of their new homes. Leonard Calvert, the brother of Cecilius, the commander of the expedition and the first governor of the Province, purchased from a tribe of Indians on the mainland a village and 30 square miles of contiguous territory. Here he established his capital and called it Saint Marie's. The colonists cultivated friendly relations with the aborigines, relations which were maintained almost uninterruptedly for the first 50 years of the colony's existence. The colonists erected a governor's house and a guard house, cultivated Indian maize, planted orchards and gardens, and soon Saint Marie's blossomed like a rose in the wilderness. But evil days were in store for them.

William Claiborne, a member of the Virginia colony, and one of their agents in London, in opposing the grant of Maryland to Lord Baltimore, had while in England on that errand, obtained from Sir William Alexander, the secretary of state for Scotland, a license to trade to Nova Scotia, of which Alexander had acquired a grant. On his return to Virginia, he supplemented that license by another from the governor and council of Virginia to trade with Manhattan, the Dutch settlement, and New England. These were simple licenses to trade and contained no grant of land whatever. To facilitate his trade, he established a trading post on Kent Island in the Chesapeake Bay and within the limits of the grant about being made to Calvert. Lord Baltimore instructed Governor Calvert to require of Claiborne an acknowledgment of his authority, assuring him protection and security in whatever just rights he possessed. This Claiborne refused to do, and was supported in his refusal by the governor and council of Virginia to whom he referred the demand for advice. A controversy arose speedily ending in a conflict between the forces of Governor Calvert and an armed pinnace commanded by one of Claiborne's men. In this conflict lives were lost on both sides. Thus for the first time was American soil stained by English blood shed by English hands. Claiborne finally took refuge in Virginia, and Kent Island acknowledged the authority of the Lord Proprietary. The lords commissioners of plantations in 1638 ignored, on appeal, Claiborne's pretensions and sustained Lord Baltimore. One Richard Ingle, who seems to have had some connection with Claiborne, afterward invaded the Province with an armed force, took Saint Marie's, which he partially destroyed, compelled Governor Calvert to fly the province, and carried on for some time a general pillage of the inhabitants. Governor Calvert gathered a sufficient force of the colonists and compelled Ingle to desist from his piratical excursions and leave the Province.

The colony was now at peace, and owing to the genial climate, the fertile soil, favorable conditions of plantation, and the mild, tolerant and beneficent sway of the Proprietary and his government, it quickly attracted settlers and the population grew apace. This happy and prosperous condition of things continued for some years. In 1643 a colony of Puritans who had settled in Virginia, were expelled by the authorities of that colony for non-conformity in their religious worship with the Church of England. They took refuge in Maryland and solicited and obtained from the governor a large tract of land on the Severn where they made a settlement and named it Providence.

In 1650 they availed themselves of the Revolution in England, by which the government in church and state was overthrown by the Protector Cromwell, to start a revolution of their own in the Province alleging as the grounds therefor that their consciences would not permit them to swear allegiance to a Catholic proprietary, or to allow the celebration of the mass and of the rites of a Catholic Church where they could prevent them, and they accordingly set up a government of their own. Governor Stone, who had succeeded Leonard Calvert, himself a Protestant and a sympathizer with the Parliamentary party in England, marched with a force to put down the revolt. He was defeated by the Puritans, himself and several others captured. The commander of the Puritans organized a drum-head court-martial, condemned Governor Stone and the prisoners to death, and did execute four of them. Governor Stone was saved by the refusal of the soldiers to execute the order of their commander for his assassination. The rebels then appealed to Cromwell for the ratification of their acts. The Protector sustained them in the usurpation of the government of the Proprietary, but refused to sanction their attempt to rob him of his property. On the restoration of Charles II. to the throne, the usurpation ended and the Lord Proprietary's government was re-established. Cecilius Calvert died in 1675, and was succeeded by his son Charles, the third Lord Baltimore and the second Proprietary of the Province. Cecilius has expended £40,000, a very large sum for that period, on the colony, and his rule had been marked by singular good sense, practical judgment, a liberal and enlightened policy on the subject of religious freedom, care and solicitude for the rights and interests of those one might call his subjects. Charles followed generally the example of his father in the government of the colony. Full representative government became firmly established, the governor and his council constituting the Upper House and delegates elected from the counties forming the Lower House of the Assembly. Between these Houses there was occasional friction on the subject of taxation, the dues claimed by the Lord Proprietary and the administration of the affairs of the land office by his lordship's agents.

In 1680, on the occasion of the expulsion of James II. and the accession of William and Mary to the throne of England, there occurred in the Province what is known as the Protestant revolution. The government of the colonies was taken out of the hands of Charles, Lord Baltimore; but his proprietary rights were not disturbed; although efforts to do so were made by some of the inhabitants. In 1715, on the death of Charles, Benedict Leonard, his son, succeeded both to the governmental authority of the colony as well as to his proprietary rights, Benedict having become a member of the Church of England. Benedict lived but a few months, and was succeeded by Charles II., and fifth Baron of Baltimore, who, dying 24 April 1751, was succeeded by Frederick, the sixth Lord Baltimore and the fifth Lord Proprietary. Frederick died in 1771, leaving no legitimate offspring. He devised the Province by will to his natural son, Henry Harford, who was the sixth and last Proprietary of Maryland. The American Revolution in 1776 terminated forever all royal authority as well as proprietary rule over Maryland.

State History.— Under the 16th section of the charter to Cecilius Calvert, Maryland enjoyed a special exemption from all taxation by the British government. But she promptly cast in her lot with her sister colonies in the struggle for independence. She sent 20,000 of her best sons to the Continental army under Washington, who distinguished themselves by their gallantry and good conduct. While Maryland by her delegates participated in the deliberations of the Continental Congress and answered its requisitions for men and money, she persistently declined signing the Articles of Confederation until the States of Virginia, Massachusetts, Connecticut, New York, North Carolina and Georgia, which claimed the territory west of the Alleghany Mountains, should surrender that territory and all claim and title to it, whether well or ill founded to the United States in Congress assembled, to be held by that body as the common patrimony of all the states, and to form in time, in the language of the resolution of her General Assembly, «free, convenient and independent states.» This surrender was ultimately made, and Maryland signed the articles on 1 March 1781. Thus was a National public domain secured to the United States. It was for the government of this territory that the celebrated ordinance of 1787 was framed.

Maryland was the seventh State to join the American Union under the existing Constitution of the United States. She ceded in 1790 to the United States the territory on which Washington, the capital of the Nation, now stands. In the War of 1812 Maryland was the theatre of extensive military and naval operations on the part of Great Britain against the United States. A large force of British troops under the command of General Ross, supported by a fleet operating in the Bay and the Potomac River, and commanded by Admiral Cockburn, invaded Maryland, captured Washington, destroyed the public buildings, including the Capitol, and then marched to the capture of Baltimore. The Maryland troops under Gen. Smith and Gen. Stricker met the British troops at North Point, 12 miles from Baltimore City and defeated them with the loss of their commander, and the simultaneous attack by the British fleet on Fort McHenry that defended the entrance to the city by water, was repulsed. It was during this engagement between the fleet and the fort, that Francis Scott Key, who was on board the British fleet as a prisoner, wrote the National anthem, the «Star-Spangled Banner.» Had Baltimore been captured, Philadelphia, the next point of attack, would probably have fallen. A column of British troops would have entered the North from Canada, and have effected or attempted to effect, a junction with the victorious British army, while the Western frontier, from the Lakes to the Gulf, would have been aflame with an insurrection of the hostile Indian tribes instigated by British emissaries. The defeat at North Point and Fort McHenry frustrated this dangerous scheme. Maryland sent several regiments to the Mexican War, and many of her sons fell on the field of honor while gallantly leading their regiments. During the Civil War sentiment in Maryland as in the other border States, was divided. But while a majority of her citizens sympathized with the South, the State did not secede. Many of her sons joined the Confederate army, while others enlisted in the Federal regiments. Since Maryland became a State she has had four constitutions; one adopted in 1776, one in 1851, one in 1864, and the last and present one adopted in 1867. In the year 1880, Baltimore (q.v.) celebrated its 150th anniversary with a week of festivities, and in 1884 the 250th anniversary of the landing of the colonists was celebrated. In 1891, a monument was erected to Leonard Calvert, the first governor, on the site of the old city of Saint Mary's, the first capital of the State, of which scarcely a trace remains.

Religious Toleration in Maryland.— The subject of religious toleration in Maryland has given rise to much discussion and controversy as to its origin, and to whom belongs the honor of originating it. The fact that religious freedom prevailed in the colony from its foundation in 1634 to the Protestant revolution in 1690 with a brief interruption during the Puritan usurpation in 1650–60, is not denied. During this period there was no established church, no taxation for the support of one, no compulsory attendance on its services. There was perfect equality before the law for all Christian denominations. After that revolution, in 1692, the Church of England was established by an act of the Provincial Legislature, although the members of that Church were greatly outnumbered by Roman Catholics, Dissenters and Quakers. By this act conformity with its worship, and the use of the Book of Common Prayer in every chapel or place of worship in the Province, were prescribed; and an annual tax of 40 pounds of tobacco was levied on all the inhabitants for the support of the Church. In 1702, Presbyterians, Quakers, and other non-conformists were relieved of some of the disabilities and burdens imposed by the act, but those imposed on Catholics remained. The penal statutes of England against the profession and practice of the Roman Catholic faith were made operative in Maryland by several acts of the General Assembly of the province, especially by the act of 1718, which incorporated bodily into the legislation of the colony the proscriptive statutes of 11 and 12 William III. Under this intolerant legislation several Roman Catholic families left the Province and took refuge in Pennsylvania, under the milder rule of the Penns; and in 1750 Charles Carroll, grandfather of the Carroll of Carrollton, went to France to obtain from Louis XV. a grant of land in the Louisiana territory to which to remove the Roman Catholics of Maryland as a body. In this he did not succeed and the Catholics remained in the province. This religious intolerance continued to the period of the American Revolution.

Some writers have attributed this early toleration to the charter of Charles I. to Cecilius Calvert, and have therefore attributed the honor of originating it to that monarch, the friend of Laud and Strafford, and during the early part of whose reign Roman Catholics and non-conformists were equally proscribed. The statement of this claim on behalf of Charles I. bears its own refutation. Besides, the charter remained the fundamental law of the Province during both the tolerant and intolerant periods of its history, and it gave no shield or protection to the Roman Catholics persecuted for their faith during the latter period, or during the brief regime of the Puritans in 1650–60. It is plain, therefore, that the honor does not belong to Charles I. and that toleration is not to be found in the provisions of the Charter.

The originators of this liberal and enlightened policy of religious toleration were Sir George Calvert and his son Cecilius, and to them and to them only, belongs the honor of its origin. When Sir George visited his Province of Avalon in Newfoundland in 1627–8, just after his conversion to the Roman Catholic Church, he erected a Roman Catholic Chapel and a Protestant place of worship at the same time, and secured for the latter the ministrations of one

Rev. Erasmus Stourton. This divine, on his return to England, lodged an information against Lord Baltimore for permitting the celebration of the mass in his colony. If prosecuted, this charge would have subjected Calvert, under the law of England, to a heavy fine, one half of which would have gone to the Reverend informer, and to imprisonment. But owing perhaps to the favor of the king, or to the influence of powerful friends at court, the prosecution came to naught.

Cecilius Calvert was 19 years of age, when, with his father and family, he became a Roman Catholic. The change of faith of father and son in the face of the intolerant laws and the still more intolerant sentiments of the times, furnish indisputable testimony to the sincerity of their convictions. They sacrificed station, honors, offices. Both had been conscientious Protestants; they were now become equally conscientious Roman Catholics. No two men in England were so capable as this father and son, to feel and realize by their experience — and their observation, as well — for it was the era of the Thirty Years' war with all its horrors — the wrong, the injustice, the folly and the crime of religious persecution; and they resolved that in any colony where they should hold sway, they would have none of it. This noble resolve Cecilius afterward faithfully and religiously adhered to throughout his long and eventful career, as Lord Proprietary, notwithstanding strong provocations and the free hand he had to abandon this enlightened and liberal policy he inaugurated in Maryland, if he had chosen to do so; certainly as to the large body of dissenters and non-conformists with the Church of England.

In his first instructions for the government of the Colony, given to his brother Leonard on the sailing of the expedition, he enjoined this policy on him, and repeated this injunction in subsequent instructions. These instructions Leonard, sharing no doubt the sentiments of his father and brother, faithfully carried out in his able administration of the affairs of the Province.

In 1649, Lord Baltimore, exercising his right under the charter to initiate legislation, sent to Governor Calvert a body of sixteen laws to be submitted to, and enacted by, the Assembly. Among them was the celebrated Toleration Act of 1649. If not actually drawn up by Lord Baltimore himself, this Act was drawn up at his dictation. The Roman Catholic phraseology of some of the names used, and the identity of the language with that of the instructions previously sent out by him on this subject, leave no doubt on this point. «Whereas,» is the noble preamble to this Magna Charta of religious liberty, «the enforcing of the human conscience in matters of religion hath frequently fallen out to be of dangerous consequence in those commonwealths, in which it hath been practised, and for the more quiet and peaceable government of this Province, and the better to preserve mutual love and amity amongst the inhabitants thereof, be it enacted that no person or persons whatsoever, within this Province professing to believe in Christ Jesus, should, from henceforth, be in any ways troubled, molested or discountenanced for or on respect of his or her religion, nor in the free exercise thereof, nor in any way compelled to the belief or exercise of any other religion against his or her consent.» For any violation of this act, a fine was to be imposed and the offender was made liable to a civil suit for damages at the instance of the party injured. The act did not long remain on the statute book. When the Puritans overthrew the Proprietary's government in 1650, they convened a new Assembly. To this Assembly Roman Catholics were declared to be ineligible, and were not allowed to vote for members of it. The first thing this Assembly did was to repeal the act of 1649, and to pass one in lieu of it, which contained this provision, «That, none who profess and exercise the Papistic religion, commonly known by the name of the Roman Catholic religion, can be protected in this Province, by the laws of England, formerly established and yet unrepealed, nor by the government of the commonwealth of England. But are to be restrained from the exercise thereof;» of which all persons concerned were required to take notice. By a subsequent clause of this act it was provided «that all persons who professed faith in Christ Jesus . . . shall not be restrained . . . provided that this liberty shall not be extended to popery or prelacy.» This excluded Roman Catholics and Episcopalians. The contrast between the acts of 1649 and 1654 is striking. On the restoration of the Proprietary to his government in 1660, the first thing done was to repeal this law and put the act of 1649 again on the statute book; and there it remained until, as a result of the Protestant revolution in 1690, it was again repealed and followed by a body of severe and stringent laws against Roman Catholics, which made the Proprietary himself as long as he remained a Catholic, and the Catholic Colonists the only outlaws for conscience sake in a Province, opened by their liberality to the professors of every Christian Creed. This condition of things continued until 1776. In the Declaration of Rights which prefaced the first Constitution of the State of Maryland adopted in that year, the principle of religious liberty announced for the first time in 1649 was enlarged and proclaimed as the inalienable right of the citizen, and a part of the fundamental law.

Population.— Maryland had a population in 1790 of 319,728; (1850), 583,034; (1870), 780,844; (1890), 1,042,390; (1900), 1,188,044. In 1910 it was 1,295,346, an increase of 9 per cent. The principal cities are Baltimore (pop. 558,485); Cumberland (21,839); Hagerstown (16,507); Frederick (10,411); and Annapolis (q.v.) 8,609.

The Press.—There are six daily papers published in Baltimore: 'The Sun,' established in 1837; 'The American,' established in 1794; 'The Herald'; 'The German Correspondent'; 'The Daily Record,' morning papers; 'The News'; 'The World,' afternoon papers; three weekly papers, 'The Catholic Mirror'; 'The Methodist Protestant,' and 'The Telegram.' Every county town has two newspapers.

Bibliography.— Bozmon, McMahon, McSherry, Scharf, 'Histories of Maryland'; Browne, 'History of a Palatinate'; Hall's 'Lords Baltimore'; Maryland Geological, Land Office, and Statistical Reports; 'Maryland Archives'; Maryland Historical Society Publications; Fiske, 'Virginia and Her Neighbors,' and 'Critical Period in History of the United States'; Foard's 'Maryland as It Is'; Adam's 'Land Cessions.' A. Leo Knott, *Baltimore, Md.*

Maryland Campaign of September 1862. The Union army under Gen. Pope having been defeated and driven to the defenses of Washington, Gen. Lee, 3 Sept. 1862, marched from Chantilly for Leesburg. At the end of the first day's march Lee wrote to Jefferson Davis that the time seemed propitious "for the Confederate army to enter Maryland" and give her material aid in the recovery of her liberties. The next day he reached Leesburg, and again wrote that he was fully persuaded of the benefit that would result from an expedition into Maryland, and should proceed at once to make the movement, unless it was disapproved: also that he proposed to enter Pennsylvania, unless it should be deemed unadvisable upon political or other grounds. Without waiting for a reply to his two communications he crossed the Potomac at White's Ford, near Leesburg, on the 4th, 5th, and 6th, with an army of over 60,000 men, and marched to Frederick, Md., where, on the 8th, he suggested to President Davis that the position of affairs "placed it in the power of the government of the Confederate States to propose with propriety to that of the United States the recognition of our independence." On the same day he issued an address to the people of Maryland, stating his mission among them and that he was prepared to assist them in regaining the rights of which they had been despoiled. When Lee entered Maryland east of the Blue Ridge he took it for granted that the Union garrison at Harper's Ferry would be withdrawn, thus opening his line of communication through the Shenandoah Valley. This was not done, and it became necessary to dislodge the garrison from that post before concentrating the Confederate army west of the Blue Ridge, and Lee came to the decision to divide his army and capture the Union forces at Martinsburg and Harper's Ferry. On the morning of the 10th his army was put in motion from Frederick. Walker's division of two brigades crossed the Potomac at Point of Rocks, south of Harper's Ferry, and on the morning of the 13th established itself on Loudoun Heights: Jackson, with 14 brigades, marched over South Mountain at Turner's Gap, crossed the Potomac at Williamsport on the 11th, drove Gen. White from Martinsburg into Harper's Ferry (q.v.), and at noon of the 13th appeared before Bolivar Heights and invested Harper's Ferry from the Virginia side of the Potomac. McLaws, with ten brigades, marched over Brownsville Gap of the South Mountain, crossed Pleasant Valley, and on the evening of the 13th was in full possession of Maryland Heights (q.v.), thus completing the investment of Harper's Ferry and its garrison of over 12,000 men. Gen. Lee, with nine brigades of Longstreet's command and D. H. Hill's division of five brigades, followed Jackson over South Mountain, leaving Hill near Boonsboro to support Stuart's cavalry, which had been left east of the Blue Ridge. Lee, with Longstreet, moved to Hagerstown, there to await the capture of Harper's Ferry, and then to concentrate his army for a movement into Pennsylvania, the capture of Harrisburg, and the destruction of the long railroad bridge over the Susquehanna. Meanwhile Gen. McClellan, who had been placed in command of the Union troops for the defense of Washington, took the field at the head of over 87,000 men, and marched against Lee. His army, spread out like a great fan, its left on the Potomac and its right on the Baltimore & Ohio railroad, cautiously advanced on Frederick, which was occupied on the 12th, and here McClellan found a copy of Lee's orders, showing the disposition of his scattered command. Tardy pursuit began, on the morning of the 13th Franklin's Sixth corps and Couch's division were put in motion to carry Crampton's Gap, in South Mountain, and relieve the garrison in Harper's Ferry, while McClellan, with the rest of the army, marched for Turner's Gap, six miles north of Crampton's, to cross the South Mountain and attack Lee. Franklin defeated the Confederates at Crampton's Gap on the 14th and, passing into Pleasant Valley, interposed between McLaws and Lee. Burnside, with the First and Ninth corps, attacked D. H. Hill at Turner's Gap and Fox's Gap the same day, Lee retraced his steps from Hagerstown to reinforce Hill, but when night came Lee had suffered defeat. He now abandoned his intention of invading Pennsylvania, ordered McLaws to elude Franklin and recross the Potomac somewhere south of Shepherdstown Ford, and at 10 o'clock that night put his own command in motion to recross the Potomac at Shepherdstown Ford, at the same time sending an order to Jackson to march from his investment of Harper's Ferry up the south side of the Potomac to Shepherdstown and cover the crossing. He crossed the Antietam in the morning of the 15th, where he hoped that McLaws might join him, but Franklin confined McLaws in Pleasant Valley. At noon he heard that Jackson had captured Harper's Ferry, whereupon he concluded not to retreat across the Potomac, but to give battle to McClellan on the heights and banks of the Antietam, and ordered Jackson to join him as soon as possible. McClellan followed Lee on the morning of the 15th, defeated Fitzhugh Lee's cavalry brigade in the streets of Boonsboro, and in the evening reached the banks of the Antietam to see Lee's army drawn up on the heights beyond. Franklin was left in Pleasant Valley to watch McLaws and relieve Harper's Ferry. Jackson joined Lee on the morning of the 16th, bringing Walker's division with him; McLaws eluded Franklin, passed out of Pleasant Valley and through Harper's Ferry, and joined Lee very early in the morning of the 17th. The battle of Antietam (q.v.) or Sharpsburg, the bloodiest one-day battle of the war, was fought on the 17th: both armies remained inactive on the 18th, and that night Lee re-crossed the Potomac at Shepherdstown Ford. McClellan followed on the morning of the 19th to the banks of the Potomac. On the 20th a part of Fitz-John Porter's Fifth corps crossed the Potomac at Shepherdstown Ford (q.v.), and was attacked and driven back across the river with great loss. This ended the campaign. From the beginning of the campaign to its close, 5–20 September, the Union losses, including Harper's Ferry and Maryland Heights, were 2,671 killed, 11,766 wounded, and 13,542 captured or missing, an aggregate of 27,979. The Confederate losses were 1,979 killed, 9,607 wounded, and 2,336 captured or missing, an aggregate of 13,922. The results of the campaign were momentous and far-reaching; the Confederate cause lost prestige and the National cause brightened. Recognition of Confederate independence by Great Britain and France, about to be granted, was withheld, and

22 September Abraham Lincoln issued his preliminary proclamation of emancipation. Consult: 'Official Records,' Vol. XIX.; 'McClellan's Own Story'; Michie, 'Life of Gen. McClellan'; Palfrey, 'The Antietam and Fredericksburg'; Allan, 'History of the Army of Northern Virginia'; Walker, 'History of the Second Army Corps'; Long, 'Life of Gen. Lee'; Fitzhugh Lee, 'Life of Gen. Lee'; Cooke, 'Life of Stonewall Jackson'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. II.

E. A. Carman.

Maryland Heights, a bold wooded elevation in Maryland, rising 1,000 feet above the Potomac opposite Harper's Ferry (q.v.), W. Va. In these heights Elk Ridge, lying west of South Mountain, from which it is separated by the narrow Pleasant Valley, terminates. The heights are almost inaccessible, capable of strong defense, and completely command Harper's Ferry, which lies below it in the angle formed by the junction of the Potomac and Shenandoah rivers. When Harper's Ferry was seized by the Virginia forces in April 1861, Col. T. J. («Stonewall») Jackson promptly occupied Maryland Heights, and they continued in Confederate possession until June of that year, when Gen. J. E. Johnston withdrew from the line of the Potomac and fell back to Winchester. The heights were then occupied by Union troops, and 5 Sept. 1862, when Lee crossed into Maryland they were held by Col. T. H. Ford with about 2,000 men and some heavy siege and field artillery. When Lee, at Frederick, Md., found that Harper's Ferry and the heights were still held by the Union troops, he sent three columns to surround and capture the garrison of more than 12,000 men. Jackson moved from Frederick on the morning of 10 September, crossed South Mountain and the Potomac and, driving everything before him, bivouacked on the 13th near Bolivar Heights. Walker crossed the Potomac south of Harper's Ferry and seized Loudoun Heights. McLaws, with ten brigades, marched from Frederick late on the 10th, camped that night near Brownsville Gap, crossed the gap next day, and on the 12th crossed Pleasant Valley, ascended Maryland Heights, with Kershaw's and Barksdale's brigades, at Solomon's Gap, five miles north of Harper's Ferry, drove in some skirmishers and, marching southward on the crest of the mountain, was checked near nightfall by Ford's men behind a barricade of logs. In the morning of the 13th he renewed his attack, which was stoutly resisted by Ford's men, who meanwhile had been reinforced by troops from Harper's Ferry. The Union troops were finally driven from the heights into Harper's Ferry, abandoning four guns, and at 4:30 P.M. McLaws was in complete possession, and put guns in position commanding Harper's Ferry, whose garrison surrendered on the 15th. The Union loss on Maryland Heights was about 150 killed and wounded; the Confederate loss was 35 killed and 178 wounded. After Lee had been driven across the Potomac the heights were occupied 20 September by troops of the Twelfth corps. The position was strongly fortified, and when, 15 June 1863, Milroy was defeated and driven from Winchester, Gen. French moved his garrison from Harper's Ferry to the heights. Under Gen. Meade's order French abandoned the position and distributed his troops at Frederick and on the line of the Baltimore & Ohio railroad. When Lee was defeated at Gettysburg the heights were reoccupied, 7 July, by the Union forces, and continued in their possession until the close of the War. On 2 July 1864 Gen. Early reached Winchester on his way to menace Washington; Gen. Sigel, who was commanding the Union forces in and around Martinsburg, abandoned his position on the night of the 3d, crossed the Potomac at Shepherdstown, and on the night of the 5th established himself on Maryland Heights, with six regiments of infantry, 2,500 dismounted cavalry, two batteries of heavy artillery, and 26 field-guns, while Gen. Stahel was at Weverton and in Pleasant Valley, with 1,200 to 1,500 cavalry and four guns. Early followed Sigel across the river at Shepherdstown Ford, drove Stahel back and confined Sigel within his works; a heavy cannonade was kept up all night of the 6th, and there was sharp fighting next day; but, making no impression, and unable to maneuver Sigel out of his position, Early drew off and crossed the South Mountain toward Frederick.

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Maryland Historical Society. See American Historical Societies.

Maryland Yellowthroat, one of the most familiar of North American warblers (*Geothlypis trichas*). It is about 5.5 inches in length, migratory, makes a neatly concealed nest on the ground, almost always in a swamp or near a stream, and lays pink-white eggs delicately dotted with red. The plumage is bright yellow above, duller toward the tail; wings and tail greenish; under parts nearly white; and a characteristic jet-black mask across the face and on the sides of the head. The summer cry is a sharp questioning «*What of it? Where'd ye get it?*» The genus contains several related and similar species.

Marylebone, mā'rĭ-lē-bōn or mär'lĭ-bŭn, a metropolitan borough of London, England. See London.

Marysville, mā'rĭz-vĭl, Cal., city, county-seat of Yuba County; at the junction of the Yuba and the Feather rivers, and on the Northern C. and the Southern P. R.R.'s; 52 miles by rail north of Sacramento.

Charles Covilland, a Frenchman, founded Marysville in 1849, after the discovery of gold in California. A trading post named New Mecklenburg had been established some years before. Covilland called the place Yubaville, which name it retained until 1850, when Marysville was adopted, and the following year it was chartered as a city. Its location at the head of navigation and proximity to valuable mines contributed to its growth, so that in 1860 it was the third city in size in the State. Since 1865 it has declined in importance and population.

The chief manufactures are dried and canned fruits, olive oil, flour, cigars, woolen goods, and foundry products. It has considerable trade in the products of the surrounding farms, especially in grains, fruits, sheep, wool, and cattle. The mines of the vicinity contribute to its industrial wealth. The city is the seat of the College of Notre Dame (R. C.) for women, public and parish high schools, and it has a fine public library. The city hall and court-house are handsome, well-built edifices. Pop. (1855) 8,000; (1890) 3,991; (1900) 3,497; (1910) 5,430.

Marysville, Kan., city, county-seat of Marshall County; on the Big Blue River, and on the Union P. and the St. Joseph & G. I. R.R.'s; about 80 miles in direct line northwest of Topeka. The manufactures are flour, furniture, foundry and machine-shop products. The city has considerable trade in wheat, corn, fruit, and live-stock. Pop. (1910) 2,260.

Marysville, Ohio, village, county-seat of Union County; on Mill Creek, and on the Cleveland, C., C. & St. L. and the Toledo & O. C. R.R.'s; about 30 miles northwest of Columbus. It is situated in an agricultural region, in which the farm products are mostly wheat, corn, and vegetables. The chief manufactures are dairy products, wagons, carriages, cooperage products, and lumber. There are two libraries, one the public school library, the other a library maintained by the Library and Reading Room Association. Pop. (1910) 3,576.

Maryville, mā'rĭ-vĭl, Mo., city, county-seat of Nodaway County; on the Omaha, K. C. & E. and the Kansas City, St. J. & C. B. R.R.'s; about 42 miles north of Saint Joseph. It is in an agricultural region, and in the vicinity is fire-clay. The manufactures are brick, tile, foundry products, lumber, flour, corn-meal, and some dairy products. The trade is chiefly in grain, live stock, brick and tile, flour, and hogs. It is the seat of the Maryville Seminary. The prominent buildings are the county buildings, churches, and schools. Pop. (1910) 4,762.

Maryville, Tenn., village, county-seat of Blount County; on the Knoxville & A. railroad; about 18 miles south of Knoxville. It was settled as early as 1795. It is in an agricultural and stock-raising region, and near valuable marble quarries. Coal is found in the vicinity. The chief manufactures are flour, lumber, woolen goods, and dairy products. It is the seat of the Maryville College (Presbyterian), founded in 1819; the Freedmen's Normal Institute (Friends); and a normal school. Maryville has a fine court-house and some good church buildings. Pop. (1910) 2,381.

Maryville College, an institution in Maryville, Tenn.; founded in 1819 under the auspices of the Presbyterian Church. The school is coeducational, and in 1910 had 37 instructors, over 609 students and about 12,000 volumes in the library. It has a preparatory department and the college course leads to the degree of A.B.

Marzials, mär'zĭ-ạlz (Fr. mär-zē-äl), **Frank Thomas,** English author: b. Lille, France 13 Jan. 1840. He has been accountant-general of the English army from 1898, having entered the War Office during the Crimean War and served therein continuously ever since. He has published lives of Gambetta, Dickens, and Victor Hugo; 'Death's Disguises and Other Sonnets'; etc.

Marzials, Theophile, or Theophilus, English poet: b. Brussels, Belgium, 21 Dec. 1850. He was a pupil in music at London of M. L. Lawson and studied also at Paris and Milan. From 1870 he was employed in the British Museum, where he became superintendent of the department of music. He is best known as a vocal composer ('Twickenham Ferry'; 'Three Sailor Boys'; 'Wait till you Come to Forty Year'; 'Ask Nothing More'); and he also published 'A Gallery of Pigeons and Other Poems.'

Masaccio, mă-sāt'chō, **Tommaso,** properly **Guidi,** gwē'dē, Italian painter: b. San Giovanni, Tuscany, 21 Dec. 1402; d. Rome 1428. He went while very young to Rome, where he painted in the Church of St. Clemente a series of frescoes, the finest of which represents St. Catherine and the doctors before Maxentius. In 1421 he was admitted into the guild of the Speziali at Florence. Among the works of Masaccio are the frescoes in the Brancacci chapel of the Carmine, the 'Expulsion from Paradise'; 'St. Peter's Sermon'; the 'Tribute'; 'St. Peter Baptizing'; and the 'Raising of the King's Son,' the last of which was partly painted by Filippino. Consult Schmarsow, 'Masaccio-Studien' (1895).

Masai, mä-sī', an East African race, speaking the Hamitic language, and occupying the Lake Kenia district. The Masais are men of large stature and magnificent physique. They are a warlike people and live mostly in military kraals, eating nothing but beef and drinking nothing but milk. The labor is done by slaves, women and children.

Masaniello, mä-sä-nē-ĕl'ō, the commonly received name of Tommaso Aniello, Italian revolutionist: b. Amalfi 1623; d. Naples 16 July 1647. He was a fisherman at Sorrento, and in 1647 roused and led an insurrection against the Spanish viceroy, the Duke of Arcos. He was successful, and obtained the abolition of unjust taxes and the revocation of an order to establish the Inquisition at Naples. But the people soon rose against him, too, and he was assassinated. An opera, music by Auber, libretto by Scribe and Delavigne, based on his career, was presented in 1828 at Paris as 'La Moette di Portici,' and in 1829 in England in English as 'Masaniello.'

Masaya, mā-sī'ä, Nicaragua, town, in the western part, about 12 miles north of Lake Nicaragua and near Masaya Volcano, which is 3,000 feet in height. The town is connected by railroad with the cities of Leon, Managua, and Granada. Masaya is situated in an agricultural region, of which tobacco is one of the principal productions. The inhabitants are mostly Indians. Pop. 18,200.

Masbate, măs-bä'tā, Philippines, an island of the Philippines in the eastern part of the Visayan Sea, south of Luzon and northwest of Samar; greatest length 82 miles northwest to southeast; width 45 miles; area, 1,230 square miles. It is very mountainous, the central chain being semicircular in shape, extending from southwest to southeast; and there are several rivers of considerable size. Communication between towns and villages is mostly by water, as there are few roads or even trails. The staple products are sugarcane, cotton, chocolate and hemp; tobacco of a strong quality is also raised. One of the chief industries is that of stock-raising (cattle, horses and hogs); over 1,000 head of cattle are ordinarily shipped monthly to other parts of the Philippines, mostly to Manila. Other important industries are the manufacture of sugar sacks from the buri palm, the manufacture of palm mats of superior workmanship and coloring, weaving, and fishing; there is also an active trade with Manila. In March 1901 the island was united with Ticao (140 square miles), Burias (258 square miles), and the small adjacent islands, to form the province of Masbate; area of the whole province 1,732 square miles. In December 1901, the provincial governor reported general satisfaction with the government and unusual industrial activity. Pop. of province 23,069; Masbate and Ticao (q.v.) 21,366.

Masbate, Philippines, a pueblo and the capital of Masbate province, situated in the northeastern part of the island of Masbate on a peninsula dividing Palánog Port from Mobô Bay. It is a port of entry, and has a considerable trade. It has a church, a school, and some well constructed buildings. Pop. 2,400.

Mascagni, Pietro, pē'ā-trō mās-kān'yē, Italian composer: b. Leghorn, Tuscany, 7 Dec. 1863. He was educated at the Milan Conservatoire and in 1890 his opera 'Cavalleria Rusticana' brought him immediate recognition in the musical world. His songs and ballads are popular and his successful career as a composer has been further aided by his operas: 'L'Amico Fritz' (1891); 'Les Rantzau' (1893); 'Iris' (1898); etc. In 1902 he visited the United States on an operatic tour.

Mascagnite, măs-kăn'yīt, or **Mascagnine,** a native sulphate of ammonium, occurring notably at Sasso in Tuscany, where it was discovered by Mascagni, from whom it was named.

Mascarene (măs-ka̤-rēn') **Islands,** a collective name for the islands of Bourbon, Mauritius, and Rodriguez, named after Mascarenhas, a Portuguese navigator, who discovered Bourbon in 1545.

Mas'cots and Hoodoos, a mascot is a person or thing supposed to bring good luck, while a hoodoo is an influence of evil. Another name for the hoodoo is Jonah, a term originating with superstitious sailors. The word mascot was first introduced into literature by means of the comic opera 'La Mascotte' written by Audran, but in France it appears to have been in common use for a long time previously among gamesters and sporting characters. It was used to signify some object, animate or inanimate, which like the luck-penny, brought good fortune to its possessor. The word is traced back to the *patois* of Provence and Gascony, where a mascot is something which brings luck to a household. Etymologically the word is derived from masque (masked or concealed), which in provincial French is applied — as *né coiffé* is in more polished French — to a child born with a caul. Such a child was believed to be destined, not only to be lucky himself, but to be the source of luck to others. In most European countries there is a large trade in charms and talismans to bring good fortune.

The term hoodoo is a manifest corruption of African voodooism and is a modified superstition of the system of terrorism which has been cultivated for years by the voodoo priesthood with remarkable success. There is, however, no scientific foundation for belief in either hoodoos or mascots, any more than there is in a reliance upon dreams and visions. Natural laws are not to be set aside by touching a hunchback or carrying a rabbit's foot in one's pocket. It is a fact, however, that in every age of the world the goddess of chance has been worshipped under one name or another, and modern civilization has not destroyed this cult. The belief in the mascot for luck, or the hoodoo for ill-luck, is an indication of weakness and lack of decision. In the 'Iliad,' when Hector is told that «the birds are against him,» and all the omens unlucky, the Trojan hero makes answer: «Without a bird his sword the true man draws; and asks no omen but his country's cause.» See also Omens; Superstition.

Mascou'ten, a belligerent tribe of Algonquians, the French *Nation du Feu,* «Fire Nation,» dwelling along the Illinois River. They were at constant warfare with their neighbors, and are first mentioned by the earliest French missionaries as inhabiting southern Michigan, whence according to the traditions of the Ojibwas and Ottawas, they had been driven by the latter from the region around modern Mackinaw. In 1712 united with the Foxes and Kickapoo, they were almost exterminated, first by the French, and afterward by the Pottawattomi and their allies. The remnants migrated westward, and are last mentioned in 1779 as living with the Piankishaws and Kickapoos on the Wabash River. The name is derived from Mashkodainsug «little prairie people,» a title now borne by a tribe of Pottawattomi Indians resident in Kansas.

Mash'am, Abigail Hill, Lady, confidante and favorite of Queen Anne of England: b. London 1670; d. 6 Dec. 1734. A cousin of Sarah Jennings, duchess of Marlborough, and also related to Robert Harley, earl of Oxford, she passed from the service of Lady Rivers, thanks to the influence of the Duchess of Marlborough, into that of Queen Anne, in whose favor she soon displaced her cousin, making every effort to turn the queen from the Marlboroughs and Whiggery to Toryism and even Jacobitism. She was married to Samuel Masham in 1707; had him made a baron in 1712; brought her kinsman Oxford into power, but soon turned him out; and, in short, was the power behind the throne, succeeding her cousin Marlborough. She retired after Queen Anne's death. She was a plain, homely, red-nosed woman, much bepraised by Swift, and accused of vulgarity, meanness, and covetousness by the Whigs.

Mashkodainsug. See Mascouten.

Mashonaland, ma̤-shō'na̤-lănd, South Africa, a province forming the northeastern portion of South Rhodesia, between the Zambesi and Matabeleland. It consists largely of open plains and table-lands, is well watered by the Umniate and other feeders of the Zambesi, and is very fertile. The Mashonas belong to the Kaffir race, and were formerly masters of the whole territory between the Limpopo and the Zambesi, but were cooped up within their present territory by the powerful Matabele, whom they were unable successfully to resist. They are a peaceful people, clever as smiths and as weavers of cotton fabrics. The country came under the management of the British South Africa Company in 1890. It is rich in gold, which has been mined here at some remote and unknown period, old workings being still visible, and Mashonaland is with some degree of probability identified with the biblical Land of Ophir. Salisbury is the chief town. The population of Mashonaland in 1910 was estimated at 350,000, of whom 5,000 were whites and the rest natives. See Rhodesia.

Masinissa, măs-ĭ-nĭs'ạ, king of Numidia: b. 238 B.C.; d. 148 B.C. He was at first ruler only of the east portion of the country, but latterly of the whole, having, by the help of the Romans during the second Punic war, defeated Syphax, king of Western Numidia, taking him prisoner with his wife Sophonisba, whose hand had formerly been promised to Masinissa. Masinissa now made her his wife, but Scipio Africanus, fearful of her influence, claimed her as a prisoner of Rome. Unable to resist, Masinissa sent her a poisoned chalice, of which she voluntarily drank. Masinissa commanded the Roman cavalry on the right wing at the battle of Zama, which ended the second Punic war (201 B.C.).

Mask, a covering for the face, often shaped so as to form a rude representation of human or animal features. They have been in use from the most ancient times. Among the Greeks they were used, particularly in the processions and ceremonies attending the orgies of Dionysus. Some ancient masks seem to have been, like the modern ones, merely coverings for the face, but it was more usual for them to cover the whole head, and represent, with the features, the head, hair, and eyes. They were at first made of the bark of trees, then of leather, afterward of wood, which the artist fashioned according to the design of the poet. The comic masks were distinguished by a grotesque laughing countenance; the tragic ones had more dignity, but were sometimes frightful. There were also satyr masks and orchestric, or those with regular features, for dancers. They had mostly very large open mouths, within which were metallic bars or other sounding bodies to strengthen the voice of the speaker — a contrivance which was required by the construction and immense size of the old theatres. The mask used at modern masked balls or masquerades is a covering for the head and face made from a light stuff, with which a person may disguise himself and remain unknown, or perhaps represent some other character. There are whole and half masks — for example, masks for the nose and the eyes. See also CARNIVAL; MASQUERADES.

Mas'kegon (swamp people), a remnant of a tribe of Indians, part of the old Algonquin stock, who formerly lived by hunting and fishing. They are now in the «swamp region» of Canada, between Hudson Bay and Lake Winnipeg, and are classed with the Cree and Ojibwa people. To some extent they are now engaged in lumbering and a few do some farming. The estimated number of Maskegons is 2,000.

Maskelyne, măs'kĕ-lĭn, **Nevil,** English astronomer and mathematican: b. London 6 Oct. 1732; d. Greenwich 9 Feb. 1811. He was educated at Westminster School and at Trinity College, Cambridge; devoted himself to astronomy; and in 1765 was appointed astronomer royal. He made careful studies of terrestrial density, introduced into navigation the method of taking longitudes by lunar distances, and made many improvements in astronomical apparatus.

Mason, mā'sŏn, **Alfred Edward Woodley,** English novelist: b. 7 May 1865. He was educated at Oxford and among his works, the most of which have been reprinted in the United States, are: 'A Romance of Wastdale' (1895); 'The Courtship of Maurice Buckler' (1896, dramatized 1897); 'The Philanderers' (1897); 'Lawrence Clavering' (1897); 'Miranda of the Balcony' (1890, dramatized in New York 1901); 'The Watchers' (1899); 'Ensign Knightley'; 'Clementina' (1902); 'The Four Feathers' (1902).

Mason, Amelia Gere, American author: b. Northampton, Mass. She was graduated from Mt. Holyoke and studied music in New York and Boston and in 1872 was married to A. A. Mason of Providence, R. I. She has since spent much of her time in Europe engaged in literary researches, and has published: 'The Women of the French Saloons' (1891); and 'Woman in the Golden Ages' (1901).

Mason, Caroline Atwater, American author: b. Providence, R. I., 10 July 1853. She was educated in Friends' schools and in Germany, and was married to Rev. John H. Mason in 1877. She has published: 'A Titled Maiden'; 'A Minister of the World'; 'The Minister of Carthage'; 'The Quiet King'; 'A Wind Flower'; 'A Woman of Yesterday' (1901); 'The Little Green God,' which has been widely read (1902), etc.

Mason, Charles, English astronomer and surveyor: b. England about 1730; d. Philadelphia Feb. 1787. He was for years assistant astronomer at the Greenwich Observatory and was sent on various expeditions in the service of science. In 1763 he was employed with Jeremiah Dixon to survey the boundary line between Maryland and Pennsylvania and they were engaged in this undertaking until 1767, the line established becoming famous in American history as the «Mason and Dixon's Line» (q.v.). They returned to England and Mason was thereafter engaged in astronomical observations and researches until the time, the precise date of which is not known, when he returned to America. His work upon the lunar tables of Tobias Mayer which were published in London in 1787 under the title 'Mayer's Lunar Tables Improved by Charles Mason,' enjoyed a high reputation for reliability.

Mason, Francis, American missionary and Orientalist: b. York, England, 2 April 1799; d. Rangoon, Burma, 3 March 1874. He was the son of a shoemaker; studied by himself; came to the United States in 1818; worked as a shoemaker through Massachusetts; joined the Baptist Church in 1825; and in 1827 was licensed to preach; sailed for Burma in 1830; and settled in Tavoy, where he worked for 22 years. He was a brilliant linguist; reduced two Karen dialects to writing; and in 1853, upon his removal to Toungoo, published a Karen version of the Bible. He made special study of Pali literature, and of the physical and ethnical pecularities of Burma, publishing in 1852 'Tenasserim, or the Fauna, Flora, Minerals, and Nations of British Burma and Pegu' (revised 1860). His other works include: 'Life of the Karen Apostle,' a memoir of his wife (1847), and 'The Story of a Workingman's Life, with Sketches of Travel' (1870).

Mason, George, American statesman: b. Stafford (now Fairfax) County, in the «Northern Neck» of Virginia, 1725: d. 7 Oct. 1792. He spent his early life on a typical plantation. The same region produced his coworkers in the cause of the American Revolution, Richard Henry Lee and George Washington (qq.v.). Mason seems to have been tutored at home, being grounded in a knowledge of the classics, both Latin and English. His younger brother, Thomas, was sent to London to study law at the Middle Temple. George Mason was married in 1750 to Ann Eilbeck, who died in 1773. Of this union there were several children. He was married again in 1780 to Sarah Brent. The family, after 1758, resided at «Gunston Hall,» in Stafford County, a famous seat still standing on the banks of the Potomac. His energies were given to extensive planting interests.

As a member of the Ohio company, he was identified with his neighbor, George Washington, in the initial stages of the French and Indian War, growing out of the concerns of that company. In 1759 he entered the Virginia House of Burgesses, at the same time with Washington. He early protested against slavery. In 1765 he wrote: «The policy of encouraging the importation of free people and discouraging that of slaves has never been duly considered in this colony, or we should not at this day see one-half of our best lands in most parts of the country remain unsettled and the other cultivated with slaves; not to mention the ill effects such a practice has upon the morals and the manners of our people.» He drafted the «Non-Importation Association,» which George Washington presented in 1769 in Williamsburg, and the «Resolves» adopted at a general meeting of the freeholders of Fairfax County, 18 July 1774. These «Resolves» urged «that a Congress should be appointed, to consist of deputies from all the colonies, to concert a general and uniform plan for the defense and preservation of our common rights;» and «that during our present difficulties and distress, no slaves ought to be imported into any of the British colonies on this continent; and we take this opportunity of declaring our most earnest wishes to see an entire stop forever put to such a wicked, cruel, and unnatural trade.» Sparks says of these Fairfax resolves that «they constitute one of the ablest and most luminous expositions of the points at issue between Great Britain and the colonies which are to be found among the public documents of that period. Embracing the great principles and facts, clothed in a nervous and appropriate style, they are equally marked with dignity, firmness, intelligence, and wisdom.» These «Resolves» served as the basis of the association formed by the Virginia Convention of August, 1774, and that of the general Congress at its first session the following September.

He was a member of the Virginia Convention held in Richmond, July, 1775, which took measures to arm the colony and appointed a committee of safety. He declined appointment in Congress as Virginia's representative in the seat made vacant by Washington's acceptance of the command of the American forces. The mind of Mason was dominant in the Virginia Convention of 1776, so creative in State and National policies. He was the author of the Virginia Declaration of Rights, adopted by the convention on 12 June 1776. (See VIRGINIA CONVENTIONS OF THE REVOLUTION.) A copy of the first draft of this historic paper, in the handwriting of George Mason, is to be seen in the Virginia State Library. At the foot of the manuscript the author added these words: «This Declaration of Rights was the first in America; it received few alterations or additions in the Virginia Convention (some of them not for the better), and was afterward closely imitated by the other United States.» The small table upon which it is believed Mason wrote this «Declaration» is preserved at the Virginia Historical Society in Richmond. Mason's chaste and concise statement of the fundamental principles of free government deserves to rank with the foremost political charters of the English-speaking world. James Madison styles him «The master-builder of the Constitution» of Virginia, adopted 29 June, 1776, the natal day of the commonwealth.

Mason was a member of the Virginia Assembly from 1776 to 1780, and from 1786 to 1788. He was one of the committee to revise the laws of Virginia, in accordance with the changed political conditions. The other members of this committee were Thomas Jefferson, Edmund Pendleton, George Wythe, and Thomas Ludwell Lee. Mason again declined a seat in Congress, to which he was elected by the Virginia Assembly on 22 May 1777.

Mason took an active part in the Constitutional Convention of 1787, reaching Philadelphia 17 May. He urged that the President be elected by Congress, and that he be ineligible for a second term; that the States should have equal representation in the Senate; that the Supreme Court should be joined with the Executive in the exercise of the veto power; that Congress be empowered to enact sumptuary laws; «that no law in the nature of a Navigation Act be passed before the year 1808, without the consent of two-thirds of each branch of the Legislature;» and, finally, that Congress should be given the control of slavery. Madison reports Mason's speech in favor of giving Congress the control of slavery as follows: «This infernal traffic originated in the avarice of British merchants. The British government constantly checked the attempts of Virginia to put a stop to it. The present question concerns not the importing States alone, but the whole Union. * * * Slavery discourages arts and manufactures. The poor despise labor when performed by slaves. They prevent the emigration of whites, who really enrich and strengthen a country. They produce the most pernicious effect on manners. Every master of slaves is born a petty tyrant. They bring the judgment of heaven on a country. As nations cannot be rewarded or punished in the next world, they must be in this. By an inevitable chain of causes and effects, Providence punishes national sins by national calamities. He lamented that some of our eastern brethren had, from a lust of gain, embarked in this nefarious traffic. * * * He held it essential in every point of view, that the General Government should have power to prevent the increase of slavery.»

It was chiefly the failure to insert his views as to congressional control of slavery and Navigation Acts, which led Mason to reject the Constitution. Shortly before his death he told Thomas Jefferson that «the Constitution as agreed to for a fortnight before the Convention rose was such a one as he would have set his hand and heart to. * * * With respect to the importation of slaves, it was left to Congress. This disturbed the two southernmost States who knew that Congress would immediately suppress the importation of slaves. Those two States, therefore, struck up a bargain with the three New England States, that if they would join to admit slaves for some years, the two southernmost States would join in changing the clause which required two-thirds of the Legislature in any vote. It was done. * * * Under the coalition, the great principles of the Constitution were changed in the last days of the Convention.» Such was Mason's own explanation of his refusal to sign the instrument in Philadelphia and for his stalwart opposition to its ratification in the Virginia Convention, which met at Richmond in 1788. Two years later he declined an appointment to a vacancy in the United States Senate. He died at «Gunston Hall,» where he lies buried. Mason's statue forms one of the circle of the Revolutionary fathers surrounding the equestrian monument of Washington at Richmond.

Thomas Jefferson described George Mason as «a man of the first order of wisdom among those who acted on the theatre of the Revolution, of expansive mind, profound judgment, cogent in argument, learned in the lore of our former Constitution, and earnest for the Republican change on Democratic principles. His elocution was neither flowing nor smooth, but his language was strong, his manner most impressive, and strengthened by a dash of biting cynicism when provocation made it seasonable.» Consult Rowland 'George Mason.'

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Mason, James Murray, American legislator: b. Mason's Island, Va., 3 Nov. 1798; d. near Alexandria, Va., 28 April 1871. He was graduated from the University of Pennsylvania in 1818, studied law and upon being admitted to the bar established a practice at Winchester, Va. He was in public office much of the time and in 1847 was elected to the United States Senate, representing Virginia, where he proved a consistent and strong adherent to the policies favored by his State. He was the author of the fugitive slave law of 1850 and at the outbreak of the Civil War he resigned his seat in the Senate to enter the service of the Confederacy. He was sent to England with Slidell as Confederate commissioner, but was captured on the steamer Trent (see Trent Affair, the) and taken to Boston where he was confined in Fort Warren until 1862 when he sailed for Europe and until the end of the war endeavored to secure recognition of the Confederacy. After the war Mason lived for a time in Canada, but returned to Virginia some years before his death.

Mason, Jeremiah, American lawyer and politician: b. Lebanon, Conn., 27 April 1768; d. Boston 14 Oct. 1848. He was graduated at Yale in 1788, admitted to the bar in 1791, and began to practise law at Westmoreland, N. H. In 1794 he removed to Walpole, N. H., and in 1797 settled at Portsmouth, where he lived for 35 years. At the New Hampshire bar, then the most famous in the country, Mason soon reached pre-eminence, among his fellow members being Daniel Webster and Jeremiah Smith. In 1802 Mason was appointed attorney-general of New Hampshire, and in 1813 became a United States senator. He was a strong Federalist, and took a leading part in the senatorial debates on matters relating to the War of 1812, his speech on the Embargo, delivered in 1814, and that on the conscription bill, 1815, being notable among public utterances of the time. In 1817 he resigned his seat to resume his practice, but afterward served for several terms as a member of the New Hampshire legislature, and rendered great assistance in the codification of the State laws. He removed to Boston in 1832, and practised in the courts until he reached 70, when he retired, with reputation fully maintained, to the more private work of his profession.

Mason, John, American colonist, founder of New Hampshire: b. Lynn Regis, Norfolk, England, 1586; d. London, December 1635. In 1610 he served in the navy against insurgents in the Hebrides; in 1616 went as governor to Newfoundland, of which, in 1620, he published a description, and in 1626 a map. In 1617 he explored the coast of New England; obtained in 1622 a grant of a region called Mariana (northeastern Massachusetts); in the same year, with Sir Ferdinando Gorges, procured a patent for the provinces of Maine; and in 1823 sent a colony to the Piscataqua River. In 1629 he obtained a patent for the New Hampshire colony, also taking one with Gorges for Laconia, a tract including Lake Champlain. Among various prominent positions which Mason held in England was that of judge in Hampshire 1635, and in the same year he was appointed vice-admiral of New England. In 1691 his rights in New Hampshire were sold to Gov. Samuel Allen. Mason was buried in Westminster Abbey. Consult Tuttle, 'Memoir of Captain John Mason, the Founder of New Hampshire,' in an edition of Mason's description of Newfoundland (1887).

Mason, John, American colonial commander: b. in England about 1600; d. Norwich Conn., 1672. Under Sir Thomas Fairfax he served in the Netherlands; in 1630 settled at Dorchester, Mass.; in 1633 was appointed to a military command at Boston; and two years later joined with others in founding Windsor, Conn. In 1637 he was given command of an expedition of English and Indians against the Pequots (q.v.), whom he almost annihilated, completing their destruction in a second movement a little later. He removed first to Saybrook, and afterward to Norwich. For 30 years he was a major of the Connecticut forces, was a magistrate for many years, and deputy governor 1660–70. From 1642 to 1668 he served as judge of the colonial court. His 'Brief History of the Pequot War,' written at the request of the General Court, was reprinted by Increase Mather in his 'Relation of Trouble by the Indians' (1677, republished by Prince 1736). Consult Ellis, 'Life of John Mason of Connecticut,' in Sparks' 'Library of American Biography.'

Mason, John Mitchell, American divine: b. New York 19 March 1770; d. there 26 Dec. 1829. His father was pastor of an Associate Reformed Church, and the son was graduated at Columbia College in 1789, and after studying theology under his father's care for one year went in 1791 to the University of Edinburgh

He was recalled in 1792 by intelligence of his father's death, and became his successor in his pastoral charge in 1793. He planned a theological seminary to be under the authority of his denomination, and visited Great Britain for the purpose of obtaining contributions; his pulpit efforts abroad gaining him repute there as one of the first preachers of the time. The seminary being established in New York City in 1804, he was appointed its first professor of theology. In 1806 he projected the 'Christian's Magazine,' which he conducted for several years, and in which he carried on a controversy with Bishop Hobart. In 1811 he became provost of Columbia College, and by his talents and energy raised that institution to a higher character than it had ever before possessed. In 1821 he exchanged his pastorate for the presidency of Dickinson College, Carlisle, Pa., and the next year entered the Presbyterian ministry. He was one of the great pulpit orators of his day and his discourses on the deaths of Washington (1800) and Hamilton (1804) are masterpieces of their kind. See 'Life,' by Van Vechten (1856).

Mason, John Young, American politician: b. Greensville, Sussex County, Va., 18 April 1799; d. Paris 3 Oct. 1859. He was educated at the University of North Carolina; was admitted to the bar in 1819; became a judge in State and Federal courts; served several terms in the Virginia assembly; and from 1831 to 1837 was a member of Congress. Then till 1844 he was judge of the United States court for the district of Virginia, and in that year became secretary of the navy in the cabinet of President Tyler. Although he served temporarily as attorney-general under Polk, he re-entered the Navy Department. President Pierce, in 1853, appointed him minister to France, and until his death he continued to fill this diplomatic position. With James Buchanan and Pierce Soulé (qq.v.) he signed the Ostend Manifesto (q.v.).

Mason, Lowell, American musician; b. Medfield, Norfolk County, Mass., 8 Jan. 1792; d. Orange, N. J., 11 Aug. 1872. His general education was small; in music he was self-instructed and wonderfully adept even when a boy, being choir leader in Medfield when 16, and a teacher in Savannah, where he removed in 1812. In 1821 he published a collection of psalm tunes based on Gardiner's 'Sacred Melodies,' but including some of Mason's own compositions. He is best known for his hymn tunes, notably Cowper ("There is a Fountain"), and Missionary Hymn ("From Greenland's Icy Mountains"). Mason's more important publications were: 'Juvenile Psalmist' (1829); 'Lyra Sacra' (1837); 'The Psaltery' (1845); 'Carmina Sacra' (1841; new series 1852); and 'Musical Letters from Abroad' (1853). Mason's musical library is now the property of Yale University.

Mason, Otis Tufton, American ethnologist: b. Eastport, Maine, 10 April 1838; d. Washington, D. C., 5 Nov. 1908. He was graduated from Columbia University in 1861 and from 1861-84 was at the head of its preparatory school. From 1884-1908 he was curator of ethnology at the National Museum. He was a member of various scientific societies and published: 'Cradles of the American Aborigines' (1889); 'Woman's Share in Primitive Culture' (1894); 'The Origin of Inventions' (1895).

Mason, Rufus Ogden, American physician: b. Sullivan, N. H., 22 Jan. 1830; d. New York 1903. He was graduated from Dartmouth College in 1854, and from the College of Physicians and Surgeons in New York in 1859. During the Civil War he was an acting assistant surgeon. He was almost as well known as an author as he was a physician and among his books are: 'Sketches and Impressions, Musical, Theatrical and Social, Including a Sketch of the Philharmonic Society of New York' (1887); 'Telepathy and the Subliminal Self' (1897); 'Hypnotism and Suggestion in Therapeutics' (1901).

Mason, Stevens Thomson, American politician: b. Leesburg, Va., 27 Oct. 1811; d. New York City 4 Jan. 1843. He was the son of Gen. John T. Mason of the noted Mason family of that State. He received his education at Transylvania University, Lexington, Ky., to which place his father had removed in 1814. On 12 July 1831, when not 20 years of age, he was appointed secretary and acting governor of the Territory, a position he continued to occupy until 8 Sept. 1835. The death of George B. Potter, the territorial governor during his term, left Mason for several years the actual governor.

Although vigorously opposed by the people of the Territory at the time of his appointment on account of his minority, his stand in the controversy with Ohio, known as the Toledo War, brought him such popularity that he was unamimously chosen governor by the people, upon the adoption of the Constitution by the State on 2 Nov. 1835, a position to which he was re-elected in Nov. 1837. In 1840 he removed to New York City to take up the practice of law.

On 4 June 1905, under authority of the Michigan Legislature, his remains were transported from New York and re-interred in Capitol Park, Detroit, the site of the first capitol of the State.

He is known in the history of Michigan as the "Boy Governor" as he was the youngest person ever appointed to so important an executive position in the history of the Nation.

Mason, William, English poet: b. Hull 12 Feb. 1724; d. York 7 April 1797. He was educated at Cambridge, and his first publication was 'Isis,' a poem, satirizing the Jacobitism and high church principles which prevailed in the University of Oxford. In 1852 he published 'Elfrida,' a tragedy, with choral odes, on the ancient Greek model. Having taken orders in the church he obtained the living of Aston, in Yorkshire, and was appointed one of the royal chaplains. In 1759 appeared 'Caractacus,' a drama. Some years after Mason was made precentor and residentiary canon at York. One of his principal works, the 'English Garden,' a poem, appeared between 1772 and 1782; and was translated into French and German. In 1775 he published the poems of his friend Thomas Gray (q.v.) with memoirs of his life. His principal subsequent publications are: 'Odes'; 'Life of William Whitehead,' with his poems (1788); 'Essay on Church Music' (1795).

Mason, William, American musician: b. Boston 24 Jan. 1829; d. New York, 14 July 1908. He studied music in Germany under Moscheles, Hauptmann, Moritz, Dreyschock, and Liszt; made tours as a pianist in Europe and the United States. In the year 1855, with Theodore Thomas and others, he established the Mason and Thomas recitals of chamber music.

which were continued until 1868. His compositions, many in number, are mainly for the piano. He published: 'Two Pianoforte Methods' (with E. S. Hoadley); 'Pianoforte Technics' (with W. S. B. Matthews); 'Touch and Technics' (1878); 'Memories of a Musical Life' (1901); etc.

Mason, William Ernest, American legislator: b. Franklinville, N. Y., 7 July 1850. He removed with his parents to Bentonsport, Ia., in 1858, and after teaching school, 1866–70, was admitted to the bar and began practice in Chicago, Ill., in 1872. He was a member of the Illinois General Assembly in 1879, of the State Senate in 1881–5; and of Congress 1887–91. In 1897 he was elected United States Senator, in which capacity he warmly advocated the cause of Cuban independence.

Mason, Mich., city, county-seat of Ingham County; on the Michigan Central railroad; about 14 miles south by east of Lansing. It was settled in 1839, and in 1865 was incorporated as a village, and in 1875 chartered as a city. It is in a farming region and the industries are chiefly connected with farm products. The principal manufactures are foundry and machine-shop products, flour, fruit evaporators, dairy products, bricks, tiles, wagons, and carriages. The trade is chiefly in the manufactures, grain, fruit, and live-stock. The principal buildings are the court-house, the churches, and schools. The city owns and operates the electrical light plant and the waterworks. Pop. (1910) 1,742.

Mason City, Iowa, city, county-seat of Cerro Gordo County; on the Chicago, M. & St. P., the Chicago & N. W., the Iowa C., and the Chicago G. W. R.R.'s; about 115 miles in direct line north by east of Des Moines. It was settled in 1855 and its present charter was granted in 1870. It is in an agricultural and stock-raising region, fire-clay and valuable sandstone quarries are in the vicinity. Its chief industrial interests are connected with the manufacturing of sash and doors, brick and tile, flour, and lime, and the quarrying of sandstone. It has a large foundry and considerable trade in live-stock and grain. The city is a trade centre and distributing point for a large section of country, and has several wholesale establishments. The government is vested in a mayor, who holds office two years, and a council. The waterworks are owned and operated by the city. Pop. (1890) 4,007; (1900) 6,746; (1910) 11,230.

Mason and Dixon's Line, in United States history, a line popularly known as dividing the slaveholding from the non-slaveholding States. The line was surveyed by two English engineers, Charles Mason and Jeremiah Dixon, between the years 1764 and 1767, for the purpose of settling the disputed boundaries between Maryland on the one side and Pennsylvania and Delaware on the other. Their instructions were to begin at the Atlantic Ocean, and run due west to a point midway between the Atlantic and the Chesapeake Bay; thence north, so that the line should become a tangent to the northwestern boundary of Delaware, which was a circle described from Newcastle court-house as centre, with a radius of 12 miles. The line was then to follow the curve in a westerly direction till it reached a point due north of the point of tangency; thence due north till it intersected a line run due west from a point 15 miles south of Philadelphia; and thence due west until it intersected a line running due north from the source of the Potomac River. The work was done with such skill and accuracy that a revision in 1849, with instruments of much greater precision, disclosed no error of importance. The line was again surveyed between 1901 and 1903 under the direction of a joint commission representing Pennsylvania and Maryland. The line was originally marked by stones or other designations placed one mile apart. But in the course of time many of the markers disappeared, and disputes as to local boundaries arose. Pennsylvania and Maryland each appropriated $5,000 for a new survey of the line, and work was begun in April 1901, W. G. Hodgkins, of the United States Coast and Geodetic Survey, being in charge of the corps of engineers. It is the portion of Mason and Dixon's line that extends as far as the western limits of Maryland, which has been re-surveyed. Some of the original boundary stones were found to be still in place. They had been chiseled in England from limestone, and weigh 500 pounds each, being four and one-half feet high and one foot square. On one side is the letter "P," and on the other the letter "M." Every fifth stone bore the coat-of-arms of the two proprietaries. Hodgkin's men endeavored to trace the stones that were missing, and succeeded in recovering a large number. Some were doing duty as doorsteps, some were in bake-ovens, one served as a curbstone in Clearspring, Md., and two had been used in building a church along the national pike. The old markers in many instances bore curious inscriptions, some carved by soldiers of the Federal and Confederate armies during the campaigns of the Civil War. Every one of these stones that could be secured was placed in position on the boundary line. If broken, the pieces were clamped together. The stones were set in a bed of concrete, to guard against future removal. In a few localities a half-dozen or more of these stones were found in proximity. This leads to the belief that possibly they were not put to actual use as boundary markers. It is known that the full number of stones required by Mason and Dixon was imported, but in conveying them westward through the forests, so many difficulties were encountered, it is supposed, that a portion of the consignment was abandoned along the road; and in the course of years settlers found these stones useful for a variety of purposes other than that for which they were intended. This theory is substantiated by the fact that the western part of Mason and Dixon's line was found to be marked principally by mounds or wooden posts, few stones being discovered. Sufficient of the original stones were recovered to mark the entire line, with the exception of about 75 miles. Where none of the old markers was available, new marble monuments were erected.

Mason-bees, a name given to the small wild bees of the genera *Osmia, Ceratosmia,* and *Chalcidoma,* which construct their nests with sand or gravel, agglutinated together by means of a viscid saliva, and fix them on the side of walls, under stones, within the hollows of plant stems whence the pith has been removed, or avail themselves of some other cavity for that purpose. The mason-bees, like the carpenter-bees, leaf-cutters, and other allied forms of the family *Megachilidæ,* are solitary in habits, not living in communities, although groups of cells are usually found near together, made by the same mother-bee, and each containing a single egg and food,— a mixture of honey and pollen. Consult Howard, 'The Insect Book' (1901), which contains an extensive bibliography of the subject.

Masonic Fraternity, The, an organization of associated societies to which, by common consent, has been accorded the primacy among fraternal orders. Divided into groups of degrees, overlying one another like the foundation and superstructure of a symmetrical building, these constitute the three great rites of universal recognition, namely, English, American, and Scottish Masonry. The first and second are acknowledged to compose the great masonic institution as it exists in Great Britain and dependencies, and in the United States; while the elaborate Scottish Rite of 33 degrees, comprising a more limited membership therein, is the one most widely disseminated in other portions of the world. Each rite is complex in its inter-dependent system of government, and is essentially cosmopolitan, bearing upon its rolls the names of emperors, kings, princes, presidents, and governors, together with scholars, statesmen, and men of affairs, as well as those of lesser stations in church and state. The full legal title is, «The Ancient and Honorable Fraternity of Free and Accepted Masons and Concordant Orders.»

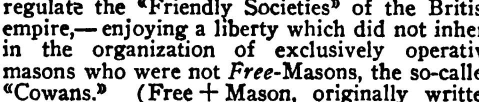
The Appeal to Antiquity.— During the 18th and first half of the 19th century masonic writers laid great stress upon the possible origin of the society in the remote ages of the past. Absolutely without any historical basis of fact or record as were most of these theories, yet men of learning loaned their influence to perpetuate the fables extant concerning the fraternity. Some asserted (*a*) that the history of the race was the story of masonry, beginning with the migration from the Garden of Eden; others (*b*) that it sprang from the Patriarchal period; and still others contended (*c*) that the society was the successor of the ancient mysteries of the Orient; (*d*) that the Temple of Solomon was its cradle; (*e*) that the Crusaders and the Knights Templars carried it forward from their times; (*f*) that the Roman colleges of artificers and builders of the Middle Ages handed down the craft to posterity; (*g*) that the civil strifes in Great Britain of the 15th and 16th centuries, and subsequent political events, made the institution possible; (*h*) and a later class of writers placed its origin to the credit of the Rev. James Anderson, D.D., and the Rev. John Theophilus Desaguliers, LL. D., F.R.S., and their compeers of «The Revival of 1717 A.D.» Several of these authors changed their views later in life; and, during the past 50 years, the intelligent masons of Great Britain, and the United States, have attempted to build up from the broken fragments of the past,— contained in fugitive lodge records extending back nearly three centuries,— a reasonable history of the «operative» masonry of the British Isles and the continent of Europe, as well as that of the present «speculative craft.» In this effort assistance has been rendered by scholars not connected with the fraternity. The critical reader will note, in the enumeration above, that many plausible theories might be founded upon both history and legend, but the strongest factor in the appeal to antiquity, nevertheless, is the «Legend of the Third Degree.» In one form or another the allegory of the fall of man, the sacrificial redemption of the race, the doctrines of the resurrection and immortal life, permeated the peoples of every age and bcame the motive of many migrations. This fact is likewise of record,— established by the discoveries made in Bible lands during the 19th century,— dating four millenaries B.C. When, therefore, a society arose which claimed to solve some of these mysteries,— nay, even to have descended from those periods,— it is not singular that the cult should have attracted disciples; especially when shielded from public gaze by a veil of secrecy, the universality of the printed page not having yet been established!

In Great Britain and on the Continent.— The consensus of reliable historical opinion affirms that the premier Grand Lodge of England, organized 24 June 1717 A.D., is the mother of all regular masonic lodges of the three craft degrees, and, therefore, peculiar interest centres in the landmarks, legends, and authentic narratives pertaining to the English rite itself, as well as in the American rite, the daughter thereof, so to speak. The apocryphal history of masonry recites that it was introduced into England by Prince Edwin, 926 A.D., and that lodges were «warranted at York,» by King Athelstan. This «Legend of the Guild» and much other traditional story, is based upon curious manuscripts called «Old Constitutions,» or «Old Charges of British Freemasons.» The oldest of these is dated, by English antiquaries, 1390 A.D., and is registered as the «Regius MS., or Halliwell Poem.» The next in age,— beginning of the 15th century,— is called the «Matthew Cooke MS.»— both in custody of the British Museum. Within the past half-century, notably the last 25 years, many more of these documents have been discovered, transcribed and printed, or published in *facsimile,* so that, including the missing versions, used or referred to therein, the catalogue has nearly 75 entries. These manuscripts have been grouped into families, because of certain characteristics common to two or more,— the whole forming a valuable collection of ancient masonic remains. Each manuscript consists of three parts: (*a*) the introductory prayer, declaration, or invocation; (*b*) the alleged history of the order, or the «Legend of the Guild»; (*c*) the peculiar statutes and duties, the regulations and observances, which masons in general, or the craft as a unit, were bound carefully to uphold and inviolably to maintain. The precise value of the «Old Charges» lies in the fact that they were the formulas used in the ceremonies of initiation by our masonic ancestors of from two to five centuries antecedent. All known copies are of English origin, even those used in Scotland; and, being of a distinctly Christian character, it has been thought they indicate ecclesiastical supervision and composition. A manuscript version of 1583 A.D., in possession of the United Grand Lodge of England, has the following «introductory prayer,» and is quoted as an example:

The mighte of the Father of Heaven and y^e wysdome of y^e glorious Soonne through y^e grace & y^e goodnes of y^e holly ghoste, y^t bee three psons & one God, be w^h vs at o^r beginning and give vs grace so to govrne vs here in or lyving that wee maye come to his blisse that nevr shall have ending. AMEN.

Signs, tokens, and words, by which the masonic craft became differentiated from all other trades than builders do not appear in the earlier forms. In time, however, this initiation was exclusively its own; and in the Melrose manuscript 1581 A.D. (known to posterity by the transcript of 1674), reference is made to «Ye privilidge of ye compass, square, levell, and ye plum-rule.» The early records show that the lodge system was used from the first as a bond to preserve the art of building as a monopoly. The secret of the organization was then,— in contradistinction to all others,— «the way to build»; and tyled lodges contributed best toward this end. But, in spite of every precaution, another body of operatives arose,— called «Cowans» by the regulars,— which in spite of its lack of prestige, not being in possession of «Old Charges» and the «mason's word,» contrived to prosper, eventually breaking down the monopoly and prepared the way for the «speculative» society of modern times. The term «speculative» has reference to a class of members who were not operatives and had no intention of becoming artisans, but were denominated «accepted» masons. The admission of this element proved the wisdom of the fathers, and to it is probably due the permanency of the institution and its continuity to succeeding ages. By its influences the masonic fraternity secured governmental favor, and became «free of the guilds,» that is, free of the restrictive laws, which, even now, regulate the «Friendly Societies» of the British empire,— enjoying a liberty which did not inhere in the organization of exclusively operative masons who were not *Free*-Masons, the so-called «Cowans.» (Free + Mason, originally written as two words, not mentioned prior to the 14th century.) Just what proportion of the membership was speculative during the earlier or operative period, unfortunately is not known, the first lodge record preserved being of a meeting held «Vltimo, July 1599,» but of its mixed character there is no doubt. Old records, recently discovered, and examined in the light of present-day research, have led masonic writers to revise the usually accepted assertion that the cathedrals and other public edifices in Great Britain, erected during the Middle Ages, were planned by church dignitaries. The opinion now obtains that the architects thereof were the Master Masons of that period,— the divisions among the builders of the operative era being apprentices, journeymen (Fellow Crafts), and Master Masons. Each man's work bore a distinguishing mark by which the piece could be identified, and the wage scale regulated. As for example:

York Minster Crypt
(1190)



By the opening years of the 18th century the decadence of the society had become so great that four of the surviving masonic lodges proceeded to a reorganization in 1717 A.D., as before stated, and this movement is known in history as «The Revival.» Four old lodges in London are known to have participated, and probably others, but the minutes are not extant. Two divines, associated with these brethren, were destined to figure as masonic architects and authors of the new *régime*: James Anderson, D.D., born in Edinburgh, 5 Aug. 1684, a minister of the Scottish Presbyterian Church in Piccadilly, London; and John Theophilus Desaguliers, LL.D., F.R.S., of Christ Church, Oxford, who was born in Rochelle, France, 12 March 1683. Anthony Sayer, a distinguished gentleman, was installed Grand Master. He was of the «speculative» craft, and of the class called «accepted.» The Grand Lodge instituted was a *governing* body, and in no wise a successor of the «General Assemblies» of the operative or legendary period. To Dr. Anderson was entrusted the duty of compiling the «general records and faithful traditions from the beginning of time,» and to enable him to do so all the available documents were collected for his use. These were afterward destroyed,— an irreparable loss. In 1723 the «New Constitutions» were published, when it was discovered that Drs. Anderson and Desaguliers had completely changed the theory of the institution,— from Christian to the adoption of a universal creed based on the Fatherhood of God and the Brotherhood of Man,— so as to admit men of all religions, nationalities, and stations in life. These authors included likewise all that is now known of the transactions of the craft from 1717 to 1722 A.D., when the official records commence. The second edition of the «New Constitutions» was published in 1738, with «New Regulations» added, which became the basis of the Freemasonry of the present day. From 1717 the evolution of the society made rapid progress, both as to the increasing area of its operations, and in the multiplicity of its degrees. But the masons of «the revival» and their immediate successors did not long dwell together in unity. Those at York organized a «Grand Lodge of All England,» in 1725, and kept it alive for some twenty years. A reorganization took place in 1761, and the body ceased to exist in 1792, never having chartered lodges outside of England. In 1751 a great schism occurred, whereby a part of the premier Grand Lodge withdrew and instituted a rival. In common parlance the latter body became known as «ancients,» the former as «moderns,» a transposition which is firmly settled in history. A deputation from the Grand Lodge of All England, dated 29 March 1779, created still another body called the «Grand Lodge of England South of the River Trent,» and this survived until 2 May 1790. The two rival Grand Lodges,— «Moderns» and «Ancients,» — happily entered into a concordat on St. John's Day, 27 Dec. 1813 A.D., constituting the present United Grand Lodge of England, declaring that the English Rite of Freemasonry «Consists of three degrees and no more, namely: those of the Entered Apprentice, the Fellow Craft, and the Master Mason, including the Supreme Order of the Holy Royal Arch.»

In Ireland no Grand Lodge records are extant of date prior to 24 June 1780 A.D. It is known that there was a lodge at Cork, the first minute of which is dated «December ye 8th, 1726.» The city archives refer to a charter for a «Society of Freemasons,» and a «Grand Lodge of Munster»; and it is known that other lodges existed prior to 1726. There was also a Grand Lodge of Cork, and one at Dublin. The last named was of record in 1728-1729; reorganized 1731 A.D., electing Lord Kingston, who is described as "Grand Master of all the lodges of Free Masons in the Kingdom of Ireland." Irish Masons possessed "Old Charges," and like their English brethren propagated the order far and wide. It was in Lodge No. 44, of Irish register, — warranted in 1735,— that the Hon. Mrs. Richard Aldworth (Elizabeth St. Leger), was initiated, and became the celebrated and only "Female Freemason" of history.

Scotland enjoys the honor of "Mother Kilwinning Lodge, No. 0," universally recognized as the oldest in existence. Its records comprise a minute of 1599, and others ranging from 20 Dec. 1642 to 5 Dec. 1758, A.D., and these communications were held in Kilwinning. Traditional history ascribes to the architects of the Abbey of Kilwinning the pre-eminence which inhered to the Masons of York, in England. A dozen other old lodges are of record, possessing fragmentary minutes and "Old Charges" of rare Masonic value, but the Scottish Craftsmen did not follow the examples set by England and Ireland until St. Andrew's Day, 30 Nov. 1736 A.D., when Baron William St. Clair of Roslin (Earl of Orkney and Caithness), was chosen Grand Master. The following year he was succeeded by George, the third and last Earl of Cromarty. It will be noted that in Scotland, as well as in England and Ireland, the craft was patronized by those of exalted civil rank and station. Scotland's "Masonic gem" is the "'Prentice's Pillar," standing in the chancel of Roslin Chapel, Edinburgh.

An unsuccessful attempt has been made to connect, historically, the building crafts of Continental Europe with the Operative Masons of Britain and Scotland. But, in Germany, in pre-Reformation times, the "Independent Stonemasons" arose, coming out from the Monastic orders as the zeal for building magnificent edifices, under ecclesiastical patronage, declined. These "lay brothers" were possessed of "Old Charges," but no authentic documents remain which refer to their most flourishing period of existence. Within the short space, however, of from 10 to 20 years, subsequent to the revival in England, Masonry of the British type had obtained a foothold in all the countries of Europe. It had crossed the seas to America, and in a list of lodges published in 1734 A.D., No. 126, of English register, is shown as located at "Boston, in New England,"— known since 5 March 1792 as St. John's Lodge.

Introduction and Early History in America. — It is a well-settled opinion that very early in the settlement of North America masons of the three classes,— operative, speculative, and the irregulars,— met in lodges, without much regard to warrants or charters, and these organizations continued until long after the revival in 1717, especially in the British colonies. Indeed, these assemblies of the craft were quite apart from regularity and the sanction of Grand Lodges. This was the fact in Philadelphia, in 1730-1; and, again, in New Hampshire soon afterward (the last named apparently having "Old Charges"), though nothing has yet been discovered to connect such meetings with the working of the "historic three degrees" of 18th century notation, and post-Grand Lodge era. This raises the mooted question as to priority in the United States. On 5 June 1730, Daniel Coxe of Burlington, N. J., was appointed Provincial Grand Master of the "provinces of New York, New Jersey, and Pennsylvania, in America," by the Duke of Norfolk, Grand Master of the premier Grand Lodge of England. On 30 April 1733, Lord Viscount Montague, Grand Master, issued a like deputation to Henry Price of Boston, appointing him "Provincial Grand Master of the province of New England, the dominions and territories thereto belonging." Masonic history is obscure as to the part Coxe took in establishing the society, but there is a complete record of the acts of Price. Because of this, Massachusetts was acknowledged to be the "mother jurisdiction" for nearly 150 years; while documents now in the archives of the Grand Lodge of Pennsylvania, and "Libre B," of the Historical Society of that commonwealth, appear to give the primacy to the Keystone State. In support of this contention evidence discovered during the last half of the 19th century goes to show that on 29 Jan. 1731, Coxe visited his Grand Lodge at London, and that a toast was there drunk in his honor, as "Provincial Grand Master of North America"; that from 1732 and for several years, a list of Grand Lodge officers was regularly printed in the *Pennsylvania Gazette*, published in Philadelphia; that, in 1734, Benjamin Franklin being elected Grand Master thereof, wrote to Provincial Grand Master Price in Boston, as to the status of masonry in Pennsylvania; that in June of that year Franklin met Price in Boston and was *recognized* to the extent of being "further instructed in the Royal Art," by the Provincial Grand Master; and that Grand Master Franklin himself *visited* the Grand Lodge of England, 17 Nov. 1760 A.D.

The rival Grand Lodges in England, together with those of Ireland and Scotland, chartered lodges everywhere, at home and abroad. Patronized by the Royal family and nobility of Great Britain the craft acquired greater prestige than history records of any other society, and a system of "military lodges" fostered expansion. The roll of warrants issued during the 18th century and subsequent to 1730, would make a large volume. From these beginnings Grand Lodges were formed in America, composed of lodges of English ("ancients" and "moderns"), Irish, Scottish, and "Army" register, increased in number by those holding Provincial Grand Masters' warrants, together with lodges chartered by the earlier American Grand Lodges in the United States and Canada, until regular governing bodies existed in every State, province and territory. Thus the craft has "followed the flag," wherever unfurled.

Knights Templars and Masonry.— The tradition that the "Baldwin Encampment," which, up to the middle of the 19th century, had been conceded to be the witness that Masonic Knights Templars were descendants of the Knights of the Crusades, is not now accepted. Its earliest accredited document bears date 20 Dec. 1780 A.D. The first reference to the Knights Templars as allied to Masonry is contained in the (lodge warrant) minutes of St. Andrew's Royal Arch Chapter, Boston, Mass., dated 28 Aug. 1769 A.D.; the earliest in England is that of Phœnix Lodge, No. 257, Portsmouth, 21 Oct. 1778. Kilwinning Lodge of Scotland, on 8 Oct. 1779, by its master, Earl Eglinton, warranted the "High Knights Templars of Ireland," at Dublin. The Grand Lodge at York sanctioned the degree of "Knight Templar" in 1780. Similar references,— at dates between the St. Andrew's Chapter's record and the institution of the Grand Encampment, Knights Templars, U. S. A., 11 June 1816 A.D.,— may be found scattered throughout the fugitive minutes of lodges and chapters wherever the British army had been stationed. Whence, then, came the modern "Order of the Temple"? An answer, founded upon historical facts, has never been made. Two theories have been advanced: (*a*) It is within the range of possibility that a connection existed between the chivalric order of Knights Templars and the fraternity of Operative Masons of mediæval times, because bodies of skilled workmen erected Templar strongholds in the Holy Land, and built their preceptories, priories, and round churches in Europe. The famous Temple Church, London, is an example. What, then, was more natural than that the Knights Templars in the 14th century, proscribed, persecuted, and despoiled of all things, should seek their perpetuation among the affiliated bodies of mechanics of whose universality and antiquity they had abundant evidence? (*b*) On the other hand, no historical doubt exists that every Freemason living since the Revival of 1717 A.D., can trace his pedigree only to Great Britain. No other association, guild or otherwise, ever grew into a society of Freemasons, nor was any connection with the building trades of the Continent ever claimed by the first Freemasons of Europe. The craft there was a direct importation from England, and in its infancy and for many years, was confined to the upper classes, without the least admixture of the artisan. This was true in Germany, where the French language that of the court and diplomacy, was the one used in keeping minutes, and the early lodges bore French names. In 1740, however, in contradistinction to English, a Scottish Masonry arose,— reputed to hail from Scotland, but having no real connection with the regular society; and from this source have emanated most of the traditions relative to the alleged transmission of the chivalric degrees from the Knights Templars, of whom Jacques de Molai,— executed 11 March 1314 A.D.,— was the last Grand Master. In order to prove the Templar succession, and the legend of Scottish Masonry, it becomes necessary to account for an interregnum between the year 1309, when Walter de Clifton, Preceptor of the Scottish Knights Templars, admitted the dispersion of his brethren, and the date when modern Templary appears of record, during the 18th century, at Boston, manifestly a historical impossibility. Nevertheless, "history fails to record much that actually occurs; much that subsequent ages would gladly know." Notwithstanding, as late as 1854, an authorized edition of "The Templars' Chart," by Jeremy L. Cross, published in New York, gave a succession of Grand Masters from Jacques de Molai,— based on a clumsy forgery of the Swedish Templars,— to the year 1838 A.D. Like many another ingenious theory, framed to connect the "old" with the "new" dispensations, tradition may be true, but it is unsupported by documentary evidence.

Organization and Degrees.— Craft Masonry was universally organized on the bases that within itself was conserved all the powers of the entire Institution. A Grand Lodge once duly established must *sui generis* be sovereign in its jurisdiction, the bounds of which soon became restricted to a state, province, or other recognized political division. The territorial limits of a Grand Lodge being sacred from invasion, and this principle enforced, Masonry has escaped the successful competition of alleged rival rites purporting to be the craft itself, and also has been secure in its privileges from any and all plans to confederate these bodies into one centralized government,— a guaranty of the perpetuation of the democracy inherent therein. But the symbolism of "Solomon's Temple" as the most glorious edifice of ancient times, probably introduced by Drs. Anderson and Desaguliers (whether from the lost MSS., or otherwise, is not essential), required a more ornate adornment and furniture than a foundation and the bare superstructure upon which Operative Masons had wrought,— hence, naturally, suggested degrees above the original three of the Revival, *et seq.* For more than a century men toiled to perfect the society,— often building better than they knew,— until the three Rites became settled as at present established. The best minds contributed toward this end. As in the Old World, so in the New, the institution had attracted to itself men of high character and standing in the governments thereof, and men of letters contributed their full quota to develop the fraternity, which was expected to endure, as these promoters believe it had already existed, for ages. France, in particular, was prolific in the "fabrication" of degrees and rites, the great volume of which survive only in the musty tomes of 18th century literature. As before inferred, the so-called Scottish Masonry became the forerunner of a rite that, perfected by scholarly masons, ultimately became the Ancient and Accepted Scottish Rite. This title is now applied to a system which was first definitely organized at Charleston, S. C., 31 May 1801 A.D. The rite in several of its degrees can boast of a very respectable antiquity, having descended from a "Council of Emperors of the East and the West," at Paris in 1758. It is also based on the three craft degrees, and its postulants must be Master Masons in good standing, in whatever other regular rite they may hold membership. The original Supreme Council in America passed through an experience similar to that of the premier Grand Lodge of England before its authority as "Mother of the Rite" was fully established in the masonic world; but peace came finally, and two recognized bodies exist in the United States: the primate, as the "Southern Jurisdiction," and the present "Northern Jurisdiction," established by a concordat, signed at Boston, Mass., by several rival Supreme Councils, 17 May 1867. This rite was introduced into England in 1845; and other Supreme Councils of this obedience exist in Scotland, Ireland, Canada, Egypt, and colonies of Great Britain; in France and dependencies, and in other countries fo Europe, excepting Russia; in South and Central America; and in the West Indies. As before stated, the masonic government is complex, no two rites — nor even Grand jurisdictions of the same rite,— being alike, owing to variances in the sequence of their degrees. The English and American are substantially in unison as to chronological order: Craft, Capitular, Cryptic, and Chivalric degrees. In the American Rite its degrees follow this notation exactly, being the Lodge, Royal Arch Chapter, Council, and Templar systems, respectively. England, Scotland, and Ireland, working the English Rite, are not altogether in accord, — additional degrees and orders being incorporated, — but, eventually, all arrive at practical universality, nevertheless. The A.·.A.·.S.·.R.·. is divided into grades or degrees: symbolic (the three Craft degrees, which are not conferred, however, in jurisdictions of the English and American Rites), Ineffable, Historical, Philosophical, Historical and Philosophical, Chivalric, Official and Executive,— conferred in lodges, councils, chapters, consistories, and supreme councils.

The Ancient Arabic Order of Nobles of the Mystic Shrine (q.v.) has fostered and developed the social side of Freemasonry, in its «higher degrees,» principally in America.

Statistics.—In the United States and Canada the membership of Symbolic Masonry is published annually, the total for the year 1903 being 962,438, in 12,704 constituent lodges, under 57 grand lodges. The net gain during 1902 was 39,500. Abroad, the privilege of membership in two or more lodges militates against an accurate enumeration, but the returns show lodges as follows: Grand Lodge of England, 2,350; Grand Lodge of Ireland, 1,009; Grand Lodge of Scotland, 614.

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Masonic Historian.

Masonry and Building. MASONRY, from the French, *maçonnerie,* meaning stone or brick work, derived from the Latin, *maceria,* a wall, is the operation and resulting construction, of laying up natural or artificial stones, generally held together or made a single mass by mortar, plaster or earth. It is the most important part of large building work, and a mason frequently becomes the general contractor for a whole building operation. The different trades required in mason building begin with building movers or the workmen who raze or demolish old buildings; then come the excavating, drainage grading, paving, piling, foundations, rubble, cut stone, including cut moldings, modeling and stone-carving, brick masonry, concrete work, fireproofing, terra-cotta work. After this heavier construction follows lighter mason work: plastering on metal or wood lathing, and stucco. Other trades employed in completing a building are steel and iron construction, sheet metal work, carpentry, painting, and glazing. The ideal of good masonry is a structure of natural or artificial stone that shall stand as the backbone of the building, firm and enduring; its great first cost shall mean no further care or expense.

History.—The Egyptian stonework was generally of enormous blocks jointed with astonishing accuracy, so as not to mar the effect of the bas-reliefs which covered several courses. Assyrian walls were laid up with bricks forming the exterior surface and the interior was filled with earth. The early Greek or Pelasgic walls were followed by more developed forms such as those called *ισόδομος* and *ψευδισόδομος* which became the Roman *Isodomum* and *Pseudisodomum* walls. *Opus reticulatum* and *opus incertum* were later Roman forms where small blocks of tufa or triangular brick were used for the exterior surface and the interior was filled with concrete. The characteristic of Greek masonry was to use local stone, accurately cut and jointed if the stone would bear it; otherwise covered with stucco. From the lintel or beam architecture of the Greeks to the arch construction of the Romans was an advance in the possibility of size of construction, but a change from a system of making the constructive forms visible and decorative to a custom of covering rough walls with a decorative shell not expressing the supporting masonry work behind. This method of building, however, gave the Romans an opportunity to make their enormous structures at a much less comparative cost, because unskilled labor could be employed to much better advantage, needing only a small number of foremen. Romanesque masonry was very crude and the thrusts of the arches were taken care of by a mass of abutments which were practically monolithic. In Byzantine work, however, the arches and domes were made from small blocks of stone and the thrusts were studied with much greater care. In Gothic work the arch became «alive,» carrying the weights and thrusts of the upper parts of the building on slender shafts, and through flying buttresses with the utmost skill to the outer walls and buttresses. Modern work has come to partake of the character of the ancient Roman construction, that is, a veneer on interior supporting masonry of a different character. In our time, however, instead of the huge concrete monolithic buildings, an iron skeleton is used, and a thin shell often not more than four inches in thickness covers a framework of steel beams that in a high building is little more than an iron bridge on end. The old Roman flat arch construction of thin bricks or tiles held together by strong cement forming domes not over six inches thick and easily spanning 15 feet or 20 feet is also used. Brick and terra-cotta are increasing in quality and variety and are admirable for covering steel construction.

Men and Material.—The workmen employed on masonry are as follows: stonecutters, who generally work in stone yards away from the building, except for such trimming as may be necessary in setting the stone; stonemasons who work on the building, setting the stone, and bricklayers. Besides these, laborers are needed for delivering the stone, mortar, etc., and for mixing mortar and concrete. The materials used are such substances as stone, brick, terra-cotta, broken stone, cinders; and adhesive materials: limes and cements, which are used with sand to make a mortar for binding the materials together. In very crude construction, mud and clay are used for a binding material. Foundation walls may be of stone laid dry; of concrete; of stone laid in Portland cement mortar or half-cement mortar, the latter consisting of sand, cement, lime, with cement and lime in equal proportions. In case of the soil under the building not being sufficiently firm, it is necessary either to drive wooden piles or to spread the foundation so far that the pressure per square foot on the soil will not be sufficient to cause the building to settle. In Chicago the footings are very large, of steel beams and concrete, making what is practically a raft so that the building really floats on a soft soil. Where the foundations are under water, as under a bridge pier, it is necessary to adopt special methods, generally sinking caissons so that workmen may go down and work under water.

Ashlar Facing.—The stone work of the outer face of a wall when it is cut and differs in character from the back of the wall is called *ashlar*. The coursing of ashlar is done in different ways. The simplest form is when it is laid out in continued courses. In this case it is caller «regular coursed ashlar.» Ashlar is also laid without long horizontal joints. In this case it is called «broken ashlar.» This is generally used when stone cannot be easily obtained of equal heights. It takes longer to lay this up, which makes it cost more than the regular courses, but makes a very attractive looking wall, having more freedom and texture. It is customary to cut the stone at the stone yard certain heights; for example, 2, 4, 6, and 8 inches so that they can be laid up without cutting any joint except the end joint, at the building. From 3 to 6 different heights are generally used, the larger number giving more variety than when the smaller number of sizes is used. Stone work is sometimes laid Flemish bond, similar to Flemish bond in brick work.

Coursed random ashlar has horizontal joints ½ to 2 feet apart, continuous. Between these joints the stone is laid up irregularly. The other stone on the walls of a building are called trimmings, which include the molded work, the window sills, jambs, and the quoins, which are the cornerstones of the building. The quoins and jamb stones, if of the same material, may be included with the rest of the ashlar. The part of the wall back of the ashlar (called the backing) is of cheaper stone or brick. It is never under 8 inches thick when of brick, and if of stone the backing is thicker. This should be built and bonded in at the same time as the ashlar in order to make a solid wall. If the stones are not high, the thickness of the ashlar should vary so that the backing can bond in and it is generally specified that the ashlar should include one through bond stone in every ten square feet of wall. If the facing is thin (2 inches to 4 inches), the pieces are clamped back into the backing by iron clamps, Random rubble is where untrimmed stones are used, and selected to fit as well as possible.

In public work and important buildings, every stone should be shown on the drawings, except when random ashlar is employed. In this case the arrangement of the stone is made by the foreman on the building, to follow a sample piece of ashlar set up and approved by the architect, instead of being shown on the drawings Ashlar is usually from 4 inches to 8 inches thick. In figuring the quantity an average of 6 inches in thickness is generally taken. The heights vary from 10 inches to 14 inches. For exterior work the ashlar should not be under 4 inches thick. The ashlar may be laid with V joints, or with rustication. In the latter case the face is generally rock-face or pointed and a draft-line 1 inch wide is carried around the edge of the stone.

Bond stones are stones that go into the wall to hold the wall together. If there are many small stones these should be frequent. In laying out ashlar the bond should be arranged to give effective stone jointing. Bond stones the full size of a pier are frequently used for caps and also placed at intervals through the pier.

Brickwork.— In brick work, the bricks are laid so as to distribute the load and tie the different portions of the wall together. Stretchers are brick which are laid showing their long side. Headers show the end of the bricks. Common bond is to lay the brick with stretchers for five courses and then lay headers for the sixth course. Face brick bond is as a rule laid of stretchers and bonded either by clipping the corners of the bricks, which ties the face of the wall to the backing or with metal wall ties, which are made of wire, crimped metal, or of tin fastened to steel wire. Flemish bond is the bond which is most frequently used to give an interesting wall surface, more pleasing than what is obtained with common bond. It is laid up with alternate headers and stretchers. The small piece inserted at the corners is called a closer. English bond consists of courses of headers and stretchers alternating. A variety of this, called English cross bond, has the alternate courses of stretchers arranged with the joints below the middle of the bricks above, making a figure resembling a cross. Sometimes every fifth course of brick is laid Flemish bond with the others straight bond. Every fifth course may be set in an inch, forming rusticated work. When walls have hollow or «vaulted» spaces not over 2 inches wide in the centre the bond is made by bricks laid across the space and cut in diagonally, or by the use of metal ties every four to eight courses. In arches, the face of the arch is made with the same bond as that shown on the wall. Common arches are made with successive rings or rowlocks, of headers.

Bricks.— Bricks at the present time are being used more and more in construction, as they are not affected by the weather, fire, or city atmosphere, which affects the softer building stones seriously. They are cheaper than stone and can be used with cut stone or terra-cotta trimmings. Hard burned bricks are used for piers, though not so good for this purpose as stone work, and in very dry soils are sometimes used for foundation walls. If there is any dampness of the soil, the outside of brick foundation walls is sometimes painted with water-proof paint. Bricks are made from sand and clay, the clay in different localities making bricks of different characteristics. A sandy clay is most desirable. For the better kinds of brick, clay is often chosen from different places and combined with the greatest care. The customary way of making bricks is to throw the clay into a large open space where it can be dumped from carts which take it from the clay bank, where it is excavated. It is ground and mixed by horse-power, water being poured in and making it all soft so that it can be pressed into molds, and sand is added as needed. If the molds in which the bricks are made are dipped in water before the clay is pressed into them, the bricks are called «water-struck» bricks. If the molds are dipped in fine sand so that the clay will not stick, the bricks are said to be «sand-struck.» This method gives a better formed brick than water-struck. The molds are taken to a smooth yard and laid in the sun where they are allowed to dry several hours, being usually sprinkled with sand and turned. Then they are piled in large piles and arranged so that fires can be built to burn until hard. The bricks next the fire, which have generally burned ends, are called «bench bricks,» while those farthest from the fire next to the outside of the kiln are called «light hard» bricks. Machines are gradually replacing this primitive form of making bricks, the whole process being carried through with little hand labor from the time of the steam shovel taking the clay from the bank until the finished brick is taken from the kiln. There are several kinds of machines, one forcing a continuous stream of clay through a die the size of a brick, while a knife on a revolving wheel cuts off bricks the proper length from this continuous line of clay. Another method forces the soft mud into a series of molds, which are taken out on the drying yard while other moulds are placed in the machines. Sometimes these bricks are taken and put in another machine which represses and re-forms the brick into a truer form; this does not, however, increase the strength of the brick. Another machine takes the clay dry, and after grinding, subjects it to great pressure, making a so-called pressed brick. These brick are more expensive than the others and have a smoother surface and nicer finish. The latest form of kiln is a series of sections arranged so that all stages of the operation are going on at the same time, the heat, after burning one section, being passed through to dry the brick just put in another section, while still other parts are being emptied or re-filled. Terra-cotta and pottery are burned in kilns which are arranged to let in heat half way up the kiln so that it will be drawn down on to the pile of terra-cotta and through the floor of the kiln into the chimney. This is said to give a more even heat. If there is iron in the clay the color of the brick will be red; the ordinary white bricks are generally due to lime. The proportion of iron makes the red of various shades, according to the amount. Lime and iron make a cream-colored brick. Brown bricks are due to the presence of magnesia; and magnesia and iron make a yellow brick. Different clays give varying color effects, and the mixture of clays with mortar colors, or painting the exposed surfaces, gives desired effects. Bricks should not absorb more than from 1/20 to 1/10 of their weight of water. This is a test that can be easily applied. Soft bricks may absorb as much as a quarter of their weight. Bricks should ring when struck, as cracked or soft bricks will give a dull sound. They should not have any cracks or large lumps or foreign substance, such as lime or coarse gravel. They should run all the same dimensions with true surfaces, though for rustic work, rough bricks are often desired. The approximate size of a brick is 2″ x 4″ x 8″. In the Eastern States 7¾″ x 3¾″ x 2¼″; but in the Western States the dimensions are slightly larger. In every case where brick work has to be figured for cutting stone trimmings, the brick should be laid up and measured. Pressed brick are generally 8⅜″ x 4⅛″ x 2⅜″ in size. Roman brick is 12 inches long and 1½ inches thick. Norman brick is 12 inches long and 2 inches thick. Bricks weigh four or five pounds apiece.

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Masonry (Fraternity). See MASONIC FRATERNITY.

Masoola, mạ-soo'lạ, a boat common on the east coast of India, adapted to be beached on the surf-beaten shore. The planks are sewed together with coir, over wads of the same material, which press upon the seams. The boats are 30 to 35 feet long, 10 to 11 feet beam, 7 to 8 feet deep, and are rowed by 12 men, oars double banked, and a steersman with an oar at the stern.

Masora, măs'ō-rạ, or **Massorah**, a Hebrew word signifying «tradition,» the name of a collection of notes referring to the Hebrew text of the Old Testament, and written in Chaldee chiefly on the margin of Hebrew MSS. These notes are various in their character, critical, grammatical, and explanatory. At what time the accumulation of these notes was commenced cannot be ascertained. According to some Jewish writers the notes are in some cases as old as the time of Moses; according to others they were begun in the time of Ezra. A useful edition of the Masora is the translation of Dr. Ginsburg (3 vols. 1880–7). See JUDAISM — *The Massorah.*

Maspero, Gaston Camille Charles, găs-tôn kä-mēl shärl mäs-pĕ-rō, French Egyptologist: b. Paris 23 June 1846. He studied in the Lycée Louis-le-Grand, 1853–65, and before entering the Ecole Normale in 1865 had already made considerable progress in the study of Egyptology. He remained in the latter college two years and attracted the attention of Mariette, the distinguished Egyptologist. In 1867 he published in the Revue Archéologique an Egyptian text and translation under the title ‘Stèle du Songe,’ and in the same year appeared separately his ‘Mémoire sur la grande Inscription d'Abydos et la Jeunesse de Sésostris.’ On leaving the Ecole Normale he went to South America to carry out researches in the Quichua language. Further memoirs on ancient Egypt extended his reputation and secured his appointment in 1869 as professor of the Egyptian language and archæology at the Ecole des Hautes Etudes. In 1871 he issued an important essay, ‘Des Formes de la Conjugaison en Egyptien ancien, en Démotique et en Copte’; and in 1873 ‘De Carchemis Oppidi Situ et Historia antiquissima’ and ‘Du Genre epistolaire chez les anciens Egyptiens.’ In 1874 he succeeded Rougé as professor of Egyptian philology and archæology at the College de

France. Sent to Egypt in 1880 as head of a government archæological mission, he succeeded Mariette in the following year in the directorship of excavations and antiquities. He founded and directed an archæological institute at Cairo, had charge of the museum at Bulak, now in Gizeh, carried out many excavations, with important results, and in 1886 returned to France to resume his duties at the College. In 1899 he again went to Egypt as director of excavations and antiquities. Maspero's great work is his 'Histoire ancienne des Peuples de l'Orient' (1875), which has been republished in an enlarged and revised form (1894-9). The three volumes of the later edition have been translated into English under the titles 'The Dawn of Civilization' (1894), 'The Struggle of the Nations' (1896), and 'The Passing of the Empires' (1900). His other works comprise the following: 'Contes populaires de l'Égypte ancienne' (1883), translated by him; 'Etudes Egyptiennes' (1886-91); 'Archéologie Egyptienne' (1887; Eng. trans. 'Egyptian Archæology' 1888); 'Lectures historiques' (1890; Eng. trans., 'Life in Ancient Egypt and Assyria,' 1892); 'Etudes de Mythologie et d'Archéologie Egyptiennes' (1893), invaluable to the student of the religion of ancient Egypt; besides contributions to the 'Mémoires' of the French Archæological Mission at Cairo, etc. In 1879 Maspero was made a knight of the Legion of Honor, and in 1895 commander. Since 1883 he has been a member of the Académie des Inscriptions, and in 1887 became an honorary fellow of Queen's College, Oxford, and an honorary D.C.L. of that university. See EGYPTOLOGY.

Masque. See MASK.

Masquerade, măs-kē-rād', a popular amusement, in which persons of both sexes mask or disguise themselves, and engage in dancing, or festivities. Masquerades are said to have been the invention of Granacci, an Italian, who lived in the beginning of the 16th century. See CARNIVALS.

Mass, in physics, the quantity of matter in a body. The mass of a body is the same wherever the body may be in the universe. Two bodies have equal masses if the gravitating forces with which another body acts upon them are exactly equal at equal distances. (See GRAVITATION.) Hence two bodies have equal masses if their weights are the same at the same place on the earth; so that if the metallic "weight" used by a grocer is carried from place to place, the quantities of sugar and tea balanced by it in a good pair of scales will always be the same, for the mass of tea or sugar is in every case equal to the mass of the metallic "weight." It is to be clearly understood that as the force of gravity is different at different places on the earth, the weight of any body is different at different places. To distinguish between the mass (or quantity of matter) and the weight (or force which tends to move it downward) of a body is very important in beginning the study of physics.

Mass, in the Roman Catholic Church, the celebration of the eucharistic sacrifice with all the prayers and ceremonies accompanying it. Roman Catholics believe that the mass is the unbloody oblation of the body and blood of Christ, under the appearances of bread and wine, in praise, adoration and thanksgiving to God. The word *mass* is of Latin origin, though attempts have been made to derive it from Hebrew sources, but ineffectually. It comes from the Latin word *missa* "sent," which is the participle of the verb *mittere*, "to send." Missa, according to some, may mean prayers sent to God or the sending or offering up of the sacrifice to God. But the commonly accepted, and no doubt correct, origin of the term is from the expression in the liturgy, used to dismiss first the catechumens after the gospel and the sermon, and then, the faithful at the end of the service: *Ite, missa est;* "Go, the meeting is dismissed." In the early Church when the Discipline of the Secret (q.v.) was part of the Church's economy in self-preservation against a virulently hostile paganism, the catechumens, that is, converts in course of instruction, were not permitted to remain through the more sacred parts of the eucharistic service; these were reserved for the faithful alone, who were fully acquainted with the profounder mysteries. The first part of the service was therefore called *missa catechumenorum,* the mass of the catechumens, and the second, *missa fidelium,* the mass of the faithful; and so, in the sequel, the entire service received the name of *missa* or mass. After the stress of persecution had relaxed and the need of the enforcement of the Discipline of the Secret had passed, the dismissal of the catechumens ceased, and all were suffered to remain throughout the entire ceremony.

At first the bishops and priests celebrated together, but as the number of the faithful increased, and communities of Christians rose, not merely in the cities, but also in the villages, priests celebrated the divine service independently; at first they officiated only before the whole community, and on days appointed for the purpose; at a later period also on ordinary days, and even alone, for their own benefit, with the assistance of one altar servant only. Thus originated with the high or solemn mass also the private mass, performed by the priest, assisted by one altar servant only. The celebration of the eucharistic sacrifice, or the mass, separate from the preaching, became more and more common, the people participating only in the public services. In the private mass the responses, etc., were made by a servant of the altar, and the priest alone took the sacred elements. It is now the law of the Church that in all private masses the priest must have one server to represent the body of the faithful. What is called Solitary Mass, that is, where no one is present to make the responses, is now forbidden. The priest, who celebrates, always communicates for the integrity of the sacrifice; but it is not necessary for any of the congregation to do so.

The mass consists of four chief parts:—1, the introduction is called the *evangelium,* or gospel, and formerly constituting, with the sermon, the mass of the catechumens; 2, the *offertorium,* or the oblation of bread and wine before the consecration; 3, the consecration or transubstantiation, when the elements of bread and wine are changed into the body and blood of Christ; 4, the communion. These four chief parts, of which the latter three are considered the most essential, are composed of several smaller parts, each having its proper denomination; they consist of prayers, hymns, shorter and longer passages of the Holy Scriptures, and a number of ceremonies, which, as the essential point of the mass is the sacrifice of the Lord, consist partly of symbolical ceremonies commemorative of important circumstances in the Saviour's life, or signs of devotion and homage paid to the presence of the Lord in the host. The order of these ceremonies, and of the whole celebration of the mass, is given in the missal, or mass-book. The masses are modified according to many circumstances. Thus certain parts are changed according to the saint in honor of whom the mass is celebrated, or the seasons of the year connected with different events in the Saviour's life, or the purpose for which the mass is said, as the *missa pro defunctis* (mass for the dead). The *mass of the day* is such as is proper to the season, or to the feast which is celebrated. *Votive mass* is one which does not correspond with the office of the day, but is said by the choice of the priest. *High mass* is that which is sung by the priest assisted by a deacon and subdeacon or other clergy and the responses sung by the choristers, generally accompanied by musical instruments. *Low mass* is the ordinary mass celebrated by the priest without music. Consult: O'Brien, ‘History of the Mass and Its Ceremonies in the Eastern and Western Churches’; Gihe, ‘The Holy Sacrifice of the Mass, Dogmatically, Liturgically, and Ascetically explained’ (6th ed., 1904); Rock, ‘Hierurgia, or the Holy Sacrifice of the Mass’; Cardinal Bona, ‘The Mass.’

Massa, măs'sä, or **Massa di Carrara,** Italy, the capital of the province of Massa e Carrara, situated on a hill three miles from the Gulf of Genoa, and 20 miles by rail southeast of Spezia. It is an episcopal see, has a cathedral, public library, and academy of arts and sciences, and an ancient ducal palace now used as the prefectural building. The chief industry is the quarrying of the superior white marble in the vicinity; tobacco, silk, cotton, paper, and oil are manufactured.

Massachuset, măs-ạ-choo'sĕt, a tribe of North American Indians of the Algonquian stock, formerly living in the neighborhood of Massachusetts Bay, between Salem and Plymouth. A pestilence in 1617 greatly reduced their number and they gradually disappeared. See ALGONQUIN; INDIANS.

Massachusetts, one of the 13 original States of the Union, and the most populous of the New England States; between lat. 41° 14′ and 42° 53′ N., and between lon. 69° 55′ and 73° 32′ W. from Greenwich. Its greatest length is 184 miles and greatest breadth 113¾ miles, the average breadth being 47¾ miles. Capital, Boston. Population (1910) 3.366.416. Its familiar name ‘The Old Bay State» is due to its location upon Massachusetts Bay, an inlet of the Atlantic Ocean which forms the eastern boundary of the State. It is bounded on the north by the States of New Hampshire and Vermont; on the west by the State of New York; on the south by the States of Rhode Island and Connecticut, together with the Atlantic which, skirting the southeastern coast, forms between the outlying islands of Martha's Vineyard and Nantucket, belonging to the State, a broad waterway known as Nantucket Sound and an inlet called Buzzard's Bay, beyond the eastern extremity of Long Island Sound. The name «Massachusetts» is compounded from Indian words meaning «Great Hills Place,» alluding probably to heights of land near the coast in the vicinity of Boston. The present State seal, adopted in 1780 in place of other devices previously in use, shows an Indian holding in his right hand a bow and in his left an arrow pointing downward, all of gold, displayed upon a blue shield, and in the upper corner, above the right arm of the Indian a silver star having five points. The motto, adopted for Massachusetts by the Provincial Congress in 1775 is, in Latin, «*Ense petit placidam sub libertate quietem,*» or in English, «With the sword she seeks quiet peace under liberty.»

Topography.— The area of the State comprises 8,315 square miles, 8,040 square miles being land surface, and 275 water. A portion of the Appalachian Mountain system forms two distinct ranges crossing the western part of the State from north to south. Of these, the Taconic range on the extreme western border has as its highest elevation Mount Greylock (3,535 feet) in the northwestern corner of the State, which is also the highest elevation found within Massachusetts. Thence the range falls to an elevation of 2,624 feet near the southwestern corner. The other or Hoosac range farther east has, as its highest peak, Spruce Hill (2,588 feet), its general height ranging, however, from 1,200 to 1,600 feet. Mount Tom (1,214 feet) and Mount Holyoke (955 feet) are conspicuous elevations rising above the valley of the Connecticut River. Mount Wachusett (2,108 feet) and Mount Watatic (1,847 feet) in the north central part of the State are also noteworthy. An elevated plateau, 1,100 feet high at its greatest elevation, forms the central portion of the State and slopes gradually toward the east, the highest point near the coast being the Great Blue Hill of Milton (620 feet). The sandy peninsula or arm of land known as Cape Cod is a distinguishing feature of the topography of the State, enclosing between the bend and the main coast the considerable body of water known as Cape Cod Bay. The main coast line, some 300 miles in extent, affords excellent harbors, especially at Boston, New Bedford, Gloucester, and Salem.

Rivers and Lakes.— The principal rivers are the Connecticut, crossing the State from north to south, approximately 40 miles east from the western boundary; the Housatonic, flowing south, and the Hoosac, north, between the Taconic and Hoosac ranges; and the Merrimac, in the northeastern part of the State, having its source in New Hampshire and flowing into the Atlantic on the eastern coast. These rivers, except the Merrimac for some 15 miles from its mouth, are not navigable for shipping; but together with the Deerfield, Westfield, Chicopee, and Miller's River, branches of the Connecticut, the Nashua, and Concord, branches of the Merrimac, the Blackstone flowing from the centre of the State southerly across the Rhode Island boundary, and numerous other small streams, afford waterpower of the highest efficiency which has been fully utilized in the industrial development of the State and contributed largely to the extension and growth of manufacturing, the chief source of the wealth of its people. The Mystic and Charles rivers, flowing into Boston Harbor, and the Taunton, entering the bay at Fall River, are tidal streams each navigable for a short distance inland. There are numerous small lakes or ponds throughout the State, adding much to the beauty of the landscape, and, in many cases, utilized as sources of water supply for the inhabitants.

Geology.— The rocks are principally metamorphic of the Archæan and Palæozoic systems. In the river valleys and elsewhere there are masses of glacial drift, including sand and boulders, some of the latter being of large size. No mineral deposits of great value exist, except stone for building purposes, limestones, and sandstone of the highest quality being quarried in the Connecticut Valley and west of the Connecticut, and granite of several varieties and superior character at Cape Ann, Quincy, and to a lesser extent in other eastern sections. The elevations of the lower Connecticut Valley are composed of bolerites, feldspathic, and calcareous gneiss. There are extensive Mesozoic sandstone beds and shales in the Connecticut Valley, with small areas of syenite on each side, and an area of gneiss extending easterly from the Connecticut to the central part of the State. Syenite and porphyry are found in the east; feldspathic gneiss and granite in Plymouth and Bristol counties; gneiss and hornblende schist in Middlesex County; syenite in Essex and Norfolk counties; carboniferous deposits in Bristol and Plymouth counties, and Cambrian, Silurian and Devonian limestones, quartzites, schists, and slates west of the Connecticut.

Climate and Scenery.— The temperature is variable, and, especially in the eastern parts of the State, subject to frequent and wide fluctuations. In the early spring easterly winds prevail upon the coast, which are peculiarly trying to persons of delicate constitution. The winters are moderately severe, although near the sea there is much mild weather, during the winter months, and the fall of snow is not excessive. The summers are frequently marked by periods of excessive heat, and sometimes by prolonged drought. The mean average rainfall for the State is about 48 inches. The normal temperature rises above the freezing point at Boston about March 7, and the normal temperature of 60° for the day reaches Boston about May 24. It falls to 60° about September 25. Observations extending over 25 years show that upon the average experience the warmest week at Boston follows July 13. On the other hand, the coldest week follows February 24.

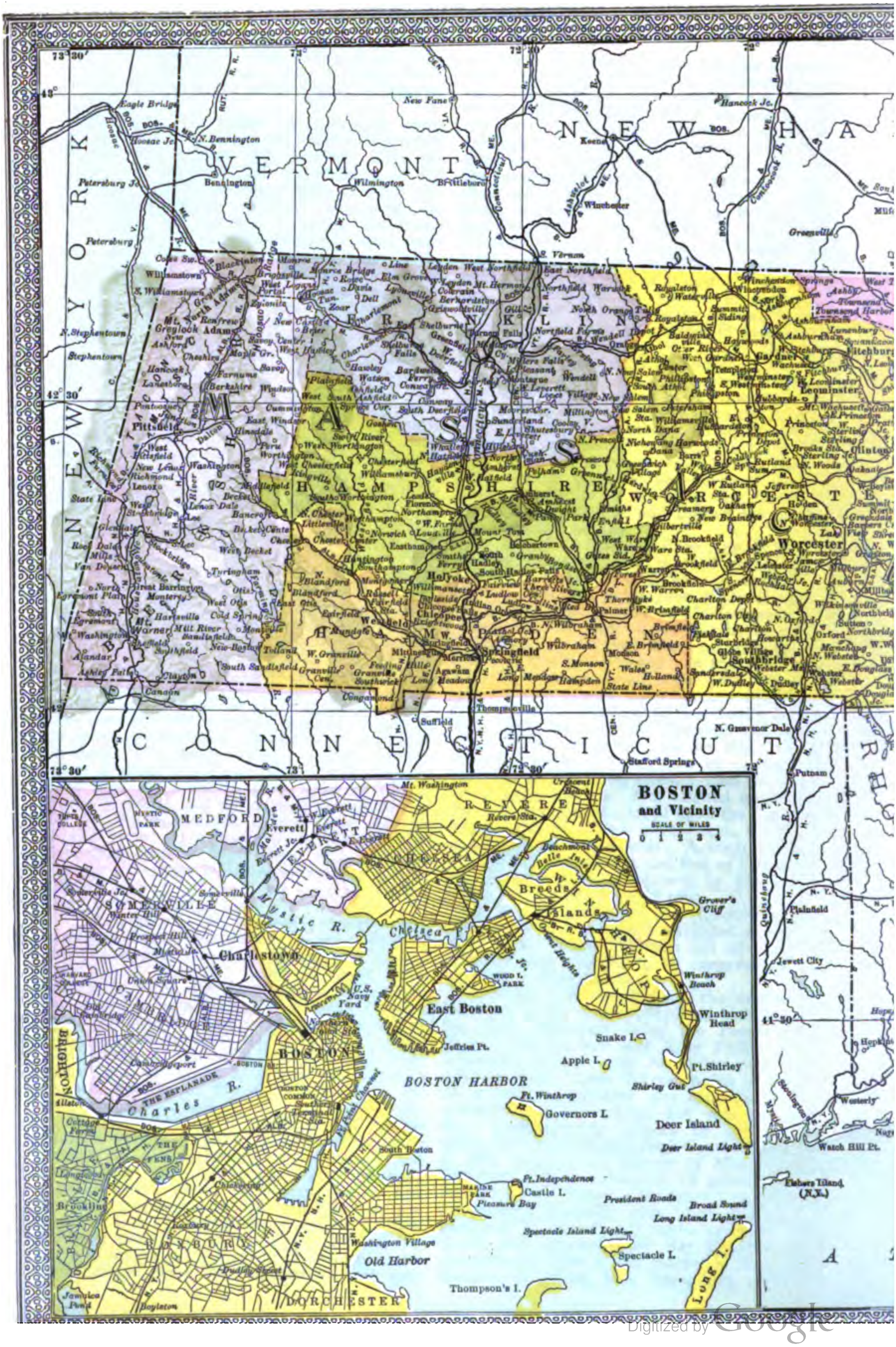
The scenery in the western counties is exceedingly picturesque, notably in the valleys of the Connecticut, Hoosac, Deerfield, and Housatonic rivers. Here are found the noted Berkshire Hills. The northeastern coast line extending southerly from Cape Ann is bold and rocky, while the southern and southeastern shores of Cape Cod and Buzzard's Bay are low and sandy. The islands of Martha's Vineyard and Nantucket, and the group known as the Elizabeth Islands, partake of the characteristics of the neighboring mainland.

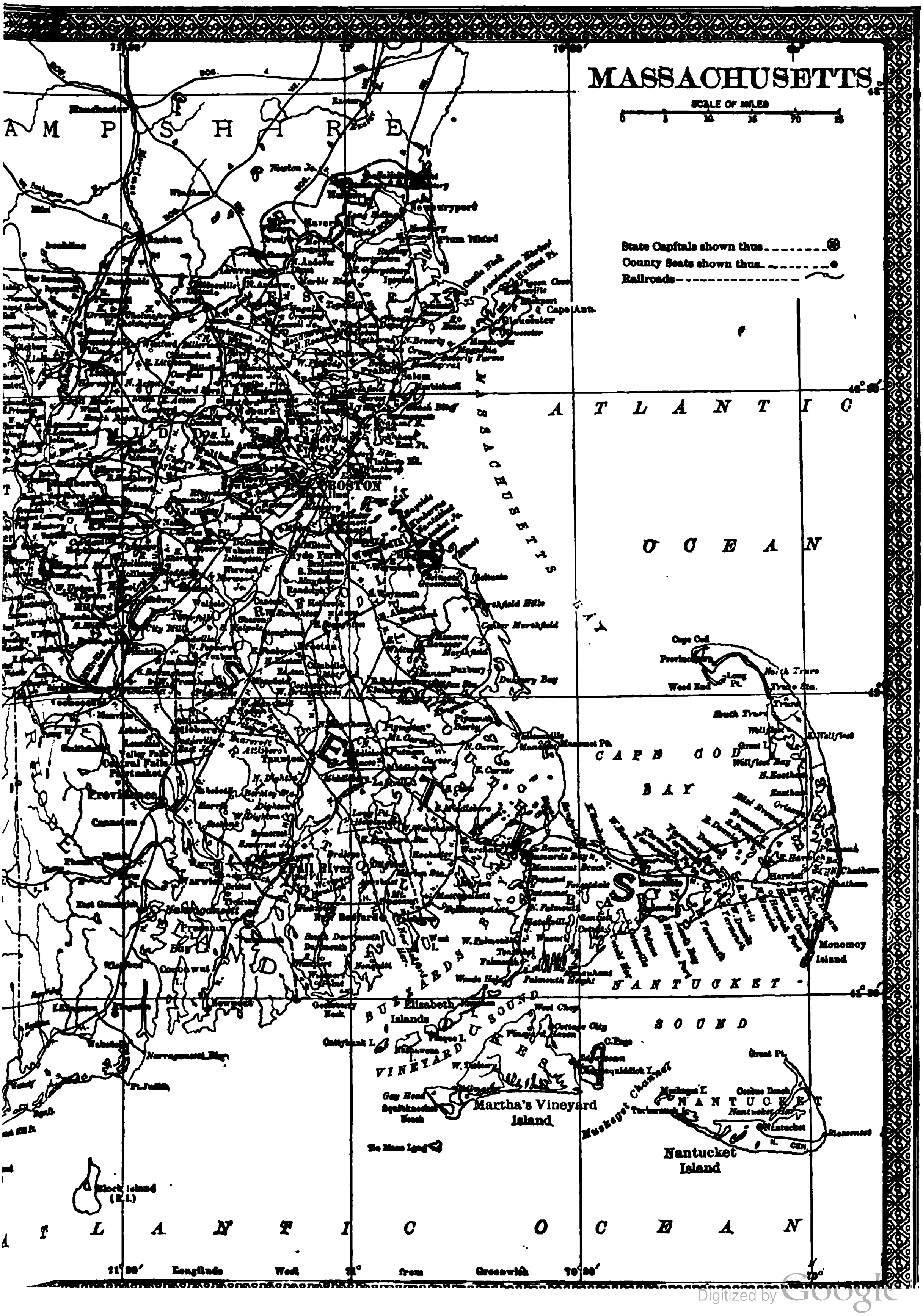
History.— The native inhabitants of Massachusetts were Algonquins of various tribes, each having its distinguishing name. The Indian nomenclature of hills, rivers, lakes, and local districts is still preserved in many cases. The first fully authenticated visit of a European explorer is that of Bartholomew Gosnold in 1602, although there are traditional accounts of the visits of others, particularly of Northmen under Leif Erikson, some 600 years earlier, with subsequent settlements maintained during three centuries, of which, however, no undisputed traces exist, although a commemorative tower erected on the Charles near Boston is claimed to mark the site of a Norwegian settlement named Norembega. Gosnold skirted the coast from Salem southward, named Cape Cod, and discovered the neighboring islands. A settlement made upon one of these was soon abandoned. Subsequent attempts at settlement by Prynne, 1603, and Waymouth, 1605, also failed. The Pilgrim Fathers, so-called, a company of English separatists who, seeking religious freedom, had, under the guidance of their pastor, John Robinson, left England for Leyden in Holland in 1607–8, sailed from Delfthaven in 1620, and soon afterward, 102 in number, from Plymouth, England, in the Mayflower (q.v.), with the intention of forming a settlement south of the Hudson River. Under stress of weather, however, they were forced to land in Provincetown Harbor 11 Nov. 1620, and finally upon the mainland at Plymouth 11 December (old style), where a settlement was established under a constitution or compact signed by all before leaving the ship, John Carver being chosen governor for one year. Despite much hardship this settlement was never abandoned and formed the basis of the Plymouth Colony.

A settlement made at Cape Ann in 1623 by English fishermen was in 1626 abandoned in favor of a location at Salem. A company of English Puritans under John Endicott, having obtained a grant of land on Massachusetts Bay, joined them in 1628. Under a charter granted the following year the Colony of Massachusetts Bay was firmly established. In 1630, the colony received large accessions under John Winthrop, and the seat of administration was soon transferred, first to Charlestown and finally to Boston. These two colonies, Plymouth and Massachusetts Bay, advanced side by side, the last named growing in importance by constant accessions, although less tolerant than the former in religious matters. The original government was indeed theocratic, based upon the Congregational form of church government, which was established by law in 1651. A confederacy including the two colonies and that of Connecticut was formed in 1643, followed by one upon a somewhat broader basis in 1663.

In the Massachusetts Bay Colony religious intolerance was frequently exhibited during the early years. Roger Williams and others whose opinions were thought to be dangerous to the community were banished.

Troubles with the Indians, the original inhabitants of the country, involved both colonies, the more important being the Pequot War, 1636–7; and the war with King Philip, 1675–6. Gradually relations with the mother country became strained. After the restoration of Charles II. a royal commission was appointed to administer the government, but was prevented from exercising its powers by the colonial authorities. The English High Court of Chancery in 1684 declared the charter of Massachusetts forfeited; and a succession of governors appointed by the Crown administered the colonial government, generally with much friction engendered by an adverse public opinion. Plymouth and Massachusetts Bay Colonies were consolidated under a new charter in 1692. The territory of Maine, New Hampshire, and Ver-


BOSTON
and Vicinity
SCALE OF MILES
0 1 2 3 4
NEW YORK
VERMONT
NEW HA
CONNECTICUT
MASSACHUSETTS
BERKSHIRE
FRANKLIN
HAMPSHIRE
HAMPDEN
WORCESTER
73° 30′
73°
72° 30′
72°
43°
42° 30′
42°
41° 30′
Pittsfield
North Adams
Williamstown
Greylock
Lenox
Lee
Stockbridge
Great Barrington
Northampton
Amherst
Holyoke
Chicopee
Westfield
Springfield
Palmer
Ware
Worcester
Fitchburg
Leominster
Gardner
Athol
Orange
Greenfield
Turners Falls
Southbridge
Webster
Brattleboro
Bennington
Wilmington
Keene
Winchester
Thompsonville
Suffield
Stafford Springs
Putnam
Plainfield
Jewett City
Westerly
Watch Hill Pt.
Fishers Island (N.Y.)
MEDFORD
Everett
SOMERVILLE
Charlestown
CAMBRIDGE
BOSTON
BRIGHTON
Brookline
ROXBURY
DORCHESTER
Jamaica Pond
Boylston
THE FENS
Charles R.
THE ESPLANADE
Mystic R.
Chelsea
REVERE
Revere Sta.
Breeds Islands
Belle Isle
Grover's Cliff
Winthrop Beach
Winthrop Head
Pt. Shirley
Shirley Gut
Deer Island
Deer Island Light
East Boston
Jeffries Pt.
Wood I. Park
U.S. Navy Yard
Snake I.
Apple I.
BOSTON HARBOR
Ft. Winthrop
Governors I.
South Boston
Ft. Independence
Castle I.
Marine Park
Pleasure Bay
President Roads
Broad Sound
Long Island Light
Long I.
Spectacle Island Light
Spectacle I.
Thompson's I.
Washington Village
Old Harbor
Mt. Washington
Crescent Beach


MASSACHUSETTS
SCALE OF MILES
0
5
10
15
20
25
State Capitals shown thus
County Seats shown thus
Railroads
AMPSHIRE
ATLANTIC
OCEAN
MASSACHUSETTS BAY
CAPE COD BAY
NANTUCKET SOUND
VINEYARD SOUND
BUZZARDS BAY
Newburyport
Plum Island
Haverhill
Lawrence
Lowell
Nashua
Manchester
Gloucester
Cape Ann
Salem
Peabody
BOSTON
Hyde Park
Randolph
Braintree
Weymouth
Marshfield Hills
Duxbury
Duxbury Bay
Plymouth
Cape Cod
Provincetown
Long Pt.
North Truro
Truro Sta.
Truro
Wood End
South Truro
Wellfleet
Wellfleet Bay
Orleans
Harwich
Chatham
Monomoy Island
Falmouth
Woods Hole
Falmouth Heights
New Bedford
Fall River
Taunton
Attleboro
Pawtucket
Central Falls
Valley Falls
Providence
Cranston
Warwick
East Greenwich
Wickford
Narragansett Bay
Pt. Judith
Elizabeth Islands
Gosnold
Cuttyhunk I.
Naushon
Pasque I.
Martha's Vineyard Island
Gay Head
Vineyard Haven
Cottage City
Edgartown
Chappaquiddick I.
Muskeget Channel
Muskeget I.
Tuckernuck I.
Great Pt.
Nantucket
Nantucket Island
Siasconset
No Mans Land
Block Island (R.I.)
ATLANTIC OCEAN
71° 30′
71°
70° 30′
70°
42° 30′
42°
41° 30′
Longitude West from Greenwich

mont formed part of the original province, separation being progressively accomplished and finally completed by the creation of the independent State of Maine in 1820.

In the colonial wars between France and England, and in difficulties with the Indians prompted by French influence adverse to the English colonies, Massachusetts was largely involved. Especially in the French and English wars, 1744–8 and 1758, the colony took an important part, contributing in great measure to the success of the expedition against Louisburg and other Canadian campaigns. In these military operations, the colonists learned to estimate their strength justly, and acquired experience which was of great value in the final struggle which resulted in independence.

Measures of taxation devised by the home government, and restrictions upon the growing commerce of the colony led to a constantly increasing spirit of resistance, and, finally to riots in Boston, 1765–8, against the enforcement of the Stamp Act (q.v.). In 1770 three citizens of Boston were shot by British soldiers, part of a garrison quartered upon the town without consent of the people. In December 1773 a cargo of tea, subject to a duty disliked by the colonists, was destroyed by being thrown into the harbor of Boston by a company of townspeople disguised as Indians. This episode is now widely known as «The Boston Tea Party» (q.v.). The port of Boston was closed in retaliation. The meeting of the General Court at Boston being postponed indefinitely, its members assembled at Salem. On 19 April 1775 the first blood of the Revolution was shed at Lexington not far from Boston, followed by the fight at Concord bridge. On 17 June occurred the battle of Bunker Hill at Charlestown, which, although counted as a British victory, exhibited the effective strength and stubborn power of resistance of the colonial forces, who, about 1,200 in number, resisted more than 3,000 British regulars, only giving way when after the third assault their ammunition failed. Throughout the war, Massachusetts took a prominent part, notwithstanding the emigration of a considerable number of loyalists to the Eastern British Provinces. She provided 67,907 troops and $820,000 in revenue. At the close of the war, Massachusetts entered the Union, its State constitution being adopted in 1780 and the Constitution of the United States ratified January 1788. In the naval operations incident to the war with England in 1812, the seamen from Massachusetts won especial credit.

The State was closely identified with the anti-slavery movement by the growth within her borders of a strong popular sentiment in favor of abolition. William Lloyd Garrison (q.v.), Wendell Phillips, and many other prominent men, were influential in this movement.

In the War of the Rebellion the State furnished 159,165 men to the Union army and navy, paying in bounties and interest on bounty loans more than $26,000,000, besides large sums in State and military aid. At the close of the war, the war debt of the State approximated $15,000,000. In the recent war with Spain the patriotic record of the State was well maintained, its quota of men being promptly furnished, and among those first in the field.

Population.— The yearly rate of increase in the population of the State is about 2.5 per cent. The industrial development of the last 30 years has stimulated the growth of factory towns and the population is now 76 per cent urban, that is, concentrated in cities and towns having 8,000 inhabitants or more. Since there are upon the average 348.9 persons per square mile of land surface the population is more dense than in any other State except Rhode Island. Although many persons born in Massachusetts have emigrated to other States, 299,614 such persons having been found in other parts of the country in 1900, nevertheless the loss has been more than compensated by accessions from abroad, from Canada, and indeed from adjacent States of the Union. The native born in the population numbered 1,959,022 and the foreign born 846,324. The increase in the native born in 1900 as compared with 1890 amounted to 23.8 per cent as against 28.8 per cent increase in the foreign born.

The number of foreign born does not of itself fully indicate the effect of immigration upon the population. This is more clearly shown by the number of persons of foreign parentage, which in 1900 aggregated 1,737,229, white persons only being considered. Less than a half of the inhabitants therefore are now of wholly native parentage.

The following table shows the place of nativity of the more numerous classes among the foreign born, and also the number of persons in the population having one or both parents born in the countries named:

Place of Birth	Foreign Born Persons	Persons having one or both parents foreign born
Ireland	249,916	647,591
Canada (English)	158,753	231,585
Canada (French)	134,416	244,586
England	82,346	149,887
Sweden	32,192	49,595
Germany	31,395	71,831
Italy	28,785	41,771
Russia	26,963	40,712
Scotland	24,332	49,596
Poland	19,971	29,412

Of the entire population 98.7 per cent is white, the remainder being persons of negro descent, Chinese, Japanese, and Indians. The growth of population and its concentration have led to the incorporation of numerous cities, of which there are now 33, as against 320 towns. Although the towns numerically preponderate, nevertheless more than 67 per cent of the entire population is now under city government. Dense as the population is when considered in the aggregate this density is confined to the cities and towns engaged in manufacturing, or which share in the residential growth promoted by the metropolitan city of Boston, which of itself has extensive miscellaneous industries. The area of the cities and towns having a population in excess of 2,500 in 1900 is, approximately, 3,395 square miles, and the population within such places shows a density of 756.14 persons per square mile. Outside of these places there is in the Commonwealth an aggregate area of approximately 4,645 square miles of land surface, more than a half of the entire area of the State, containing a population of but 238,248 persons, or an average of but 51.29 persons per square mile. Every census since 1875 has shown a considerable increase in population upon the territory occupied by towns above the

2,500 limit in 1900, and conversely, an almost constant decline in the towns outside this area. The towns which have lost are the smaller agricultural towns of the State, and while the increase in the percentage of foreign born, proportionately to the total population, has been greater in these places than in the other cities and towns, nevertheless the population in them remains to-day as in 1875 largely native born. The persons of foreign birth rapidly become assimilated and take their place in the social and political as well as in the industrial life of the State. The presence of this element has been due very largely to the industrial development of the Commonwealth, but that part of it which appears in the smaller towns is due to the taking up of agricultural land by persons of foreign birth.

Chief Cities and Towns.— The following table shows the cities of the State, arranged in order of size, with the population, from the census of 1900 and 1910:

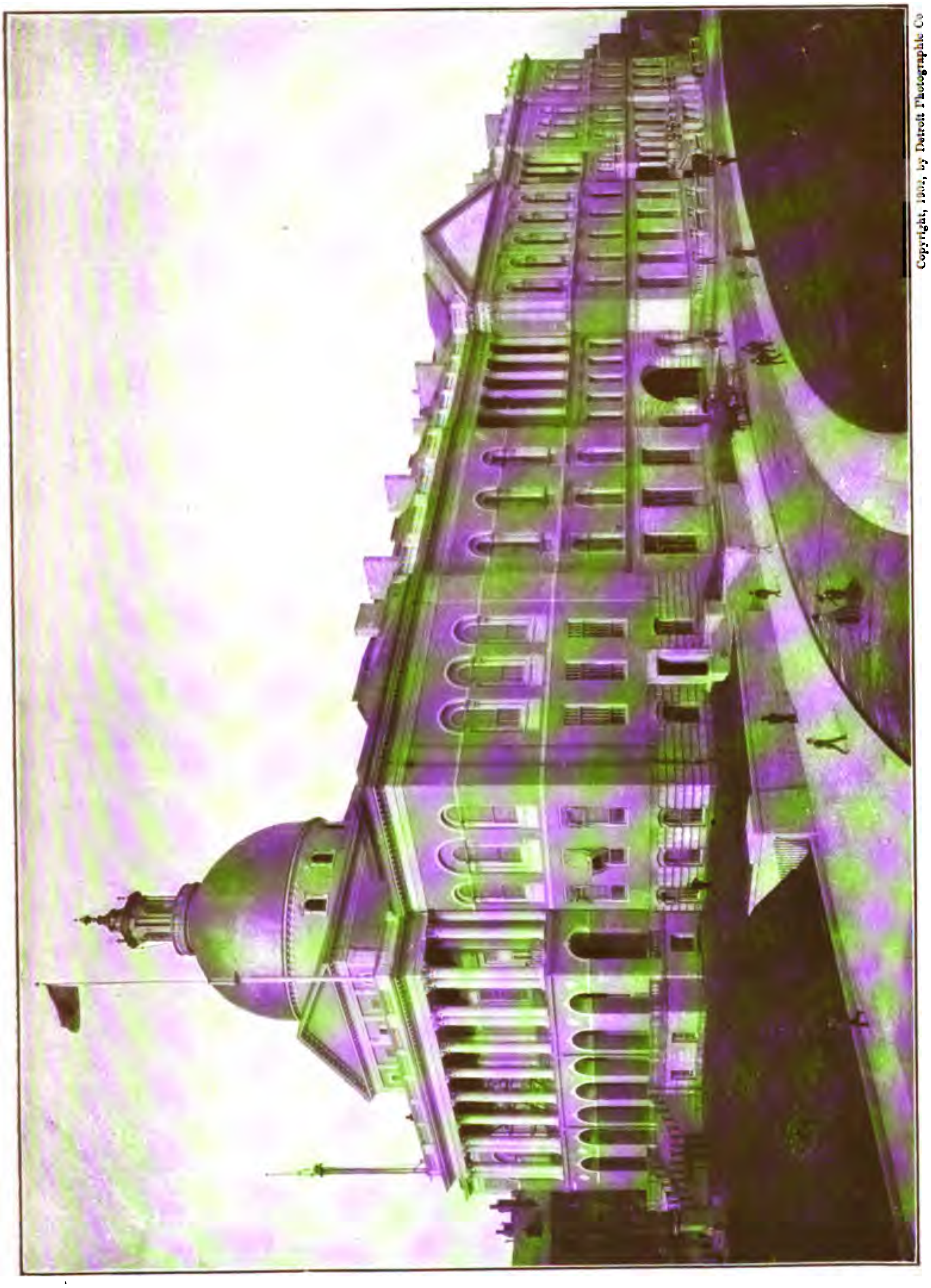
Names of Cities	Population	
	1900	1910
Boston	560,892	670,585
Worcester	118,421	145,986
Fall River	104,863	119,295
Lowell	94,969	106,294
Cambridge	91,886	104,839
Lynn	68,513	89,336
Lawrence	62,559	85,892
New Bedford	62,442	96,652
Springfield	62,059	88,926
Somerville	61,643	77,236
Holyoke	45,712	57,730
Brockton	40,063	56,878
Haverhill	37,175	44,115
Salem	35,956	43,697
Chelsea	34,072	32,452
Malden	33,664	44,404
Newton	33,587	39,806
Fitchburg	31,531	37,826
Taunton	31,036	34,259
Gloucester	26,121	24,398
Everett	24,336	33,484
North Adams	24,200	22,019
Quincy	23,899	32,642
Waltham	23,481	27,834
Pittsfield	21,766	32,121
Chicopee	19,167	25,401
Northampton	18,643	19,431
Medford	18,244	23,150
Newburyport	14,478	14,949
Woburn	14,254	15,308
Beverly	13,884	18,650
Marlborough	13,609	14,579
Melrose	12,962	15,715
Brookline	19,935	27,792
Revere	10,395	18,219
Hyde Park	13,244	15,507

Boston, the capital, is the chief city of the Commonwealth and ranks fifth among the great cities of the Union. Identified with the growth of the State from its beginning its historical landmarks are of profound interest to the visitor, and the traditions of the city, its development in modern times, its unrivaled suburbs distinguished by large numbers of tasteful and well-kept residences, its beautiful parks, public buildings, and points of literary and artistic interest, give it an important and in many respects a unique place among American cities. Other cities closely connected with the early history of the Commonwealth are Salem and Newburyport, located on the eastern coast in Essex County. Cambridge, near Boston, with which it is connected by several bridges spanning the Charles River, is the seat of Harvard University, and the former home of Longfellow and Lowell. Lowell and Lawrence upon the Merrimac, Fall River and New Bedford in Bristol County, and Holyoke in Hampden County, are all extensively engaged in textile manufacturing, Holyoke also, with Springfield, is especially interested in the production of paper of all grades. New Bedford was formerly the seat of the whaling industry now almost entirely abandoned. Lynn and Haverhill in Essex County and Brockton in Plymouth, are the centres of the boot and shoe industry. Worcester, the second city in point of size, well located near the centre of the State, is an educational centre as well, the seat of Clarke University and Holy Cross College, and is largely interested in high-class metal industries, and the manufacture of machinery. Waltham, in Middlesex County, is the site of a large watch-making establishment and has extensive textile factories. Northampton, in Hampshire, is the seat of Smith College for women. Woburn, in Middlesex, has large establishments for the production of leather. Gloucester, a seaport upon Cape Ann, is largely engaged in the fisheries. Quincy, in Norfolk County near Boston, has noted granite quarries. Fitchburg in Worcester County, Taunton in Bristol, North Adams and Pittsfield in Berkshire, Chicopee in Hampden, Beverly in Essex, and Marlborough in Middlesex, are all thriving cities with important industries; and Chelsea in Suffolk County, Everett, Somerville, Newton, Melrose, Medford, and Malden in Middlesex, are rapidly growing municipalities, largely residential, and closely connected with Boston within the metropolitan district.

Religion.— Originally, as elsewhere stated, Orthodox Congregationalism was the form of Church polity recognized by law. To-day all the principal denominations are represented. In respect to population, the Roman Catholics lead all others, more than 900,000 persons in the Commonwealth being of that faith. In church membership, the Orthodox Congregationalists rank next to the Roman Catholics, with approximately 115,000 members; followed by the Baptists (of whom there are several different bodies), with about 70,000; the Methodists (of different bodies), with about 60,000; the Unitarians, about 35,000; the Protestant Episcopalians, 30,000; and many other lesser bodies, of whom few, if any, exceed the limit of 10,000 in membership. In the value of church property, although recent exact statistics are not available, and conclusions must therefore be based upon estimates, the rank of the several denominations is the same except that the Roman Catholics change place with the Orthodox Congregationalists.

Government.—Originally based upon church membership, the conditions surrounding the suffrage have been subject to successive modifications. Dissenters from the Established Church were released from paying taxes for church purposes in 1815, and in 1833 all denominations were given equal standing before the law. Since the adoption of the original State constitution (1780) it has been twice revised by constitutional conventions held in 1820 and 1853. Numerous amendments to the original articles have been made, and new articles adopted from time to time. All male persons, 21 years of age and upward, able to read and write in the English language, and neither paupers, imbecile, or con-

MASSACHUSETTS



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STATE CAPITOL AT BOSTON.

victs are entitled to vote. The State legislature, called the General Court, consists of the Senate, 40 members, and the House of Representatives, 240 members, elected for annual terms in Senatorial and Representative districts, respectively. Annual sessions are held beginning on the first Wednesday of January and continuing until prorogation after the completion of the business of the session.

The executive branch of the State government consists of a governor, lieutenant-governor, eight councillors who are the governor's constitutional advisers in the matter of appointments and other minor executive duties, and who are chosen in councillor districts, a secretary of the commonwealth, treasurer and receiver-general, auditor of accounts, and attorney-general. These officers are all chosen in a general election annually for annual terms. The governor is by virtue of his office commander-in-chief of the military forces of the State. He has a constitutional power of veto over the acts passed by the legislature, but, notwithstanding this, vetoed bills may be passed over the veto by a two thirds vote of both branches. Important executive functions are exercised by commissions of from one to three or more members, appointed by the governor, including among others the board of agriculture, the board of education, the commissioner of insurance, railroad commissioners, harbor and land commissioners, prison commissioners, the boards of health, lunacy, and charity, the board of conciliation and arbitration (dealing with labor disputes), the chief of the bureau of statistics of labor (controlling the census, social, and industrial statistics), etc. All judges are appointed by the governor and hold office during good behavior. The judicial system comprises police, district, and municipal courts, having original jurisdiction in minor civil and criminal cases, sometimes exclusive of the Superior Court and sometimes concurrent therewith; a Superior Court with original jurisdiction in higher cases, and original and concurrent jurisdiction with the Supreme Judicial Court; and a Supreme Judicial Court, which has general supervision over all courts of inferior jurisdiction, hears appeals, decides questions of law, etc. This court has also original jurisdiction in certain cases, and original and concurrent jurisdiction with the Superior Court in others. The Superior and Supreme Judicial Courts hold regular term sittings in the several counties. The judicial system also includes courts of probate and insolvency in each county, and there are trial justices, and justices of the peace, with limited jurisdiction.

Cities are incorporated by special legislative charter, the minimum population required being 12,000. City governments are administered by a mayor and city council. Towns are independent municipal bodies other than cities, the chief executive officers being the board of selectmen, elected in town meeting by those entitled to vote. The town meetings also make appropriations and decide, by vote, other important matters relating to the affairs of the towns.

The cities and towns are grouped into counties, 14 in number, namely, Barnstable, Berkshire, Bristol, Dukes, Essex, Franklin, Hampden, Hampshire, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, and Worcester. The chief executive officers in the counties are county commissioners, elected annually.

Militia.— All able-bodied male citizens between the ages of 18 and 45 are in emergency liable to perform military duty. The present State militia force allowed by law consists of 484 officers and 6,115 enlisted men. These are organized in two brigades, the first consisting of one regiment of heavy artillery, one battalion of light artillery, one company of cavalry, two regiments of infantry, and a signal corps; and the second includes a battery of light artillery, a battalion of cavalry, three regiments of infantry, and a signal corps. There are also two corps of cadets, an ambulance corps, and a naval brigade.

Wealth, Debt, and Taxation.— Massachusetts is one of the wealthiest States of the Union. Much of the capital of its citizens is invested in enterprises out of the State. The value of real estate as fixed by the assessors of the various cities and towns for purposes of taxation was, at the date of the latest published return, $2,870,699,295. The total personal estate returned from the same sources was $899,859,527, but, with other legitimate additions, has been estimated at over a million, bringing the aggregate to $4,770,558,822, and even this is probably an under-estimate. The State's bonded debt, less the amount of sinking fund applicable to its reduction, contracted for State purposes only, namely, loans for the construction of hospitals and other public buildings, the abolition of railway grade crossings, unpaid remainders of war debt, etc., amounts to $79,657,066. The Commonwealth carried in 1902 temporarily an indirect indebtedness which, less sinking fund accumulation, amounted to $52,491,378, this representing loans contracted for the benefit of certain municipalities and metropolitan districts, within which the credit of the State was pledged to aid the development of parks, water systems, sewerage construction, and armory construction, the communities benefited being assessed annually for the payment of interest and finally for the payment of the principal. The net debt of the State, direct and indirect, was then $65,964,006, although, as will be seen, the larger part of this was in point of fact municipal indebtedness authorized by the State legislature.

The aggregate tax levy for State, county, and municipal purposes, for the year covered by the latest report, amounts to $50,827,713. Of this, $1,608,217 is a poll tax assessed under a provision of law requiring the payment of such a tax, limited to $2 per capita, by every male inhabitant of the Commonwealth above the age of 20 years, whether a citizen of the United States or an alien. The rate of local taxation in the different cities and towns, per thousand dollars of valuation, real and personal, varies from $26 to $5.50; rates from $5.80 to $9.80 being assessed in 13 towns; $10 to $14.90 in two cities and 119 towns; $15 to $19.80 in 30 cities and 143 towns; and $20 to $25 in one city and 43 towns. Under the tax system of the State, real estate is taxed to the owner wherever residing, the tax being payable in the city or town where the estate is located. Personal property taxes are payable in the town where the holder resides. Corporations are subject to a tax upon their capital stock, assessed and payable through the office of the State Commissioner of Taxation, the proceeds being distributed to the municipalities wherein the stockholders reside, in proportion to the amount of shares held by them respectively. Shares in such corporations are therefore exempted from local taxation. Real estate and personal property in general is, on the other hand, subject entirely to local assessment, and, theoretically, at its full value. Incomes in excess of $2,000 are taxable. Property held solely for religious, charitable, or educational purposes, is exempt from taxation.

Banks.—The latest published 'Statistical Abstract of the United States,' covering the year 1909, reports the number of national banks in the State as 197; about 30 being in Boston. The aggregate savings deposits of the national banks is $11,526,824.86; and the number of depositors 31,405. In 20 national banks in Boston the loans and discounts on 1 September 1909 were $191,439,615. This is a leading «reserve city.»

Loan and trust companies number 43. They have 15,722 depositors and savings deposits to the extent of $7,125,738. On 30 June 1909 the aggregate savings deposits of all banks, including national and savings banks and trust companies, amounted to $747,150,028, or an average per capita upon the number of depositors (2,049,137) of $365; the per capita average being by classes as follows: National banks, $367; loan and trust companies, $453; savings banks, $363.

The banks for savings are governed by a carefully guarded statute, and these institutions as well as co-operative banks (co-operative savings and loan associations) and trust companies are under the supervision of the State commissioners of savings banks. The savings banks, at the close of the year covered by the latest published return, numbered 187, the number of deposit accounts being 2,002,010; amount of deposits, $728,497,465, the increase over the previous year being more than $21,000,000. The average amount to each account was $363.74, the deposits amounting, on the average, to $230 to each person of the population. The savings banks throughout the State have been managed conservatively and very few losses have occurred; but the expense of management is remarkably low, the percentage of expense to total management being but .00234. The co-operative savings banks, which are really building associations, receiving deposits from their members in regular monthly payments, accumulating interest thereon, and loaning the amounts received to members only, principally upon first mortgages on real estate, have been uniformly successful and number about 130, the assets aggregating $30,400,000. The Massachusetts statute governing these institutions is a model in legislation of this kind, carefully protecting the interests of the members, who, by the method of regular savings inherent in the system, are gradually accumulating considerable sums in cash, or acquiring home ownership.

In their relation to commerce, the financial interests of the State are largely centred in Boston. The first bank in this city, one of the earliest institutions of the kind in the country, was established in 1784 and still continues. Banking operations here have generally been conducted with conservatism and prudence. Since 1898 the aggregate banking capital invested in the city has been much reduced, and weak banks eliminated or strengthened by consolidation. The clearing-house exchanges for 1909 covered by the latest returns amount to $8,232,992,100.

Education.—From the earliest years the education of the people has been a vital subject of public concern. Harvard College at Cambridge was founded in 1636, and as early as 1647 it was provided in the colonial laws «to the end that learning may not be buried in the graves of our forefathers» . . . «that every township after the Lord hath increased them to the number of fifty households, shall appoint one to teach all children to write and read; and when any town shall increase to the number of one hundred families, they shall set up a grammar school, the master thereof to be able to instruct youth so far as they may be fitted for the University; provided that if any town neglect the performance hereof above one year, that every such town shall pay five pounds to the next school, till they shall perform the order.» The spirit of this early law still continues. It has always been the policy of the Commonwealth to preserve the principle of local control of the schools, thus promoting the direct interest of the taxpayers in the several municipalities. Hence while the State law provides under penalty that schools shall be maintained in every city and town, these are administered by local boards termed school committees, elected by the people and clothed with broad general authority. Women, as well as male voters, may vote for the election of these officers. The State Board of Education, appointed by the governor, has advisory powers, intended to foster and promote the highest efficiency of the public schools, but no direct control of local schools, except in certain matters of general concern, such as the distribution of the income of the State school fund in aid of the schools in the poorer towns. This board through its agents exercises limited supervisory authority wherever aid is thus furnished. The board also directly administers the State normal schools established for training teachers. Such schools exist at Framingham, Westfield, Bridgewater, Salem, Worcester, Fitchburg, North Adams, Hyannis, and Lowell, besides a State Normal Art School at Boston, expressly devoted to the training of teachers in drawing and the arts of design. The buildings provided by the State for normal instruction are of the highest character, of modern construction, and all full equipped. The number of pupils in attendance approximates 1,700, and of 13,905 teachers employed in the public schools during the year covered by the latest published return, 6,498, or 46 per cent, had received normal instruction.

School attendance is compulsory between the ages of 7 and 14, and public schools must be maintained at least 32 weeks in every year, except that in towns under the valuation of $200,000 the time may, by consent of the board of education, be reduced to 28 weeks. Cities and towns containing 500 families must maintain high schools as well as those of lower grade. Towns not subject to this requirement must pay for the tuition of their children who attend the high school of some other municipality, but sums so paid are reimbursed by the State to towns whose valuation does not exceed $500,000. Cities and towns containing 20,000 inhabitants or more must maintain manual training in their schools. Towns may establish industrial schools, and any town may, and if of 10,000 inhabitants or more must, maintain annually evening schools for the instruction of persons over 14 years of age in elementary branches, and evening high schools must be maintained in cities of 50,000 or more inhabitants. The education of the children is further promoted by stringent provisions of law prohibiting under any circumstances the employment for wages of any child under 14 during the hours when the public schools are in session, and, unless certain educational requirements are met, of those under 16, in factories, workshops, or mercantile establishments. The number of children attending the public schools during the year covered by the latest published returns, was 474,234; the average membership, 415,533, and the average attendance 380,026, or 92 per cent of the average membership. At the same time there were 341,334 children in the State between the ages of 7 and 14. Of these, 299,065 were enrolled in the public schools, and the enrolment in private schools was 87,337. Evidently the law requiring school attendance is well enforced.

The total annual expenditure for public school purposes for the same year was $15,132,133, of which $3,442,063 was for school buildings. Of the whole amount 97 per cent was derived from local taxation. The average cost to the towns in taxation was $27.10 for the school support of each child in the average membership, requiring an expenditure of $3.70 for each $1,000 of the State's valuation, or about 23 per cent of the average tax for all municipal purposes. The effective ventilation of school buildings is required under definite provisions of law enforced by the State inspector of factories and public buildings, and in the larger towns and cities these buildings are generally of the highest types of such edifices in this and in all other respects, large numbers having been erected within recent years. Under a law which went into effect 1 July 1902, every city and town must employ a superintendent of schools. Towns under a valuation of $2,500,000 each must effect unions, under specified conditions for this purpose. The minimum salary of the superintendent within such a union is fixed at $1,500, of which the State pays half.

The higher educational institutions within the State include the following: Harvard College (q.v.) at Cambridge, founded 1636; Williams College (q.v.) at Williamstown, 1793; Amherst College (q.v.) at Amherst, 1825; Mount Holyoke College (q.v.), for women, at South Hadley, 1837; College of the Holy Cross at Worcester, 1843; Tufts College (q.v.) at Medford, 1850; Massachusetts Institute of Technology at Boston, 1861; Boston College at Boston, 1863; Massachusetts Agricultural College at Amherst, 1863; Worcester Polytechnic Institute at Worcester, 1865; Boston University at Boston, 1869; Wellesley College (q.v.), for women, at Wellesley, 1870; Smith College (q.v.), for women, at Northampton, 1871; Clark University at Worcester, 1887; and Simmons College at Boston, 1902. Radcliffe College at Cambridge, having certain affiliations with Harvard but no legal connection with it, is devoted to the collegiate education of women, and there are also many seminaries and private schools of various grades in the State.

Libraries.— Free public libraries form an important element in the educational equipment of the State. These institutions, free to all the citizens in the various cities and towns, are practically universal, only a fractional percentage of the population being without such privileges. The establishment of such libraries has in recent years been fostered by grants of money from the State treasury, and by the creation of a Free Public Library Commission, appointed by the governor, established to promote public library usefulness and to aid in founding such institutions where not then existing. This commission makes annual reports to the legislature upon matters within its jurisdiction. There are also numerous circulating and association libraries, not free to the public. The latest returns from all classes of libraries within the State, both secular and religious, show 2,028 libraries, containing 7,367,764 volumes, valued at $9,873,700, and having a circulation for home use of 8,461,276 volumes. These figures, however, are from the State census of 1895 and are undoubtedly much below the present totals. The Boston Public Library, housed in a building which is one of the most noteworthy architectural monuments in the United States, is the largest free public circulating library in the country, and contains nearly 900,000 volumes; the Harvard University library has more than 500,000; the Boston Athenæum, 210,000; and the public libraries at Springfield, and Worcester, the State Library in the State House at Boston, and that of the American Antiquarian Society at Worcester, each exceed 10,000 volumes. (See LIBRARIES.)

Charitable and Penal Institutions.— The State institutions dealing with the defective classes include hospitals for the insane at Worcester, Taunton, Northampton, Danvers, and Westborough, and the Insane Asylum, so-called, at Medfield. The government of these institutions is in each case vested in a board of seven trustees, of whom five must be men and two women, one to be appointed annually by the governor and council, the place of the senior member being vacated each year. The Massachusetts Hospital for Epileptics at Foxborough is also controlled by seven trustees appointed in the same manner. By a law enacted in 1900 provision is made for a State Colony of the Insane, managed by a similar board of seven trustees. The Massachusetts School for the Feeble-minded at Waltham is governed by six trustees appointed by the governor for three-year terms. The Hospital Cottages for Children at Baldwinville has five trustees; the Massachusetts Hospital for Dipsomaniacs and Inebriates at Foxborough, five trustees; the Massachusetts Charitable Eye and Ear Infirmary at Boston, two trustees on behalf of the State; the Massachusetts General Hospital, four trustees on behalf of the State; the Massachusetts Homœopathic Hospital at Boston, five trustees on behalf of the State; the Massachusetts State Sanatorium at Rutland (for consumptives), five trustees; all these trustees being appointed for fixed terms by the governor. The Perkins Institution and Massachusetts School for the Blind at South Boston, has four trustees on behalf of the State, similarly appointed; and the Soldiers' Home at Chelsea, three. There are special educational institutions for the deaf in which the State is interested and to which educable children of this class may be sent, in accordance with the policy of the Commonwealth which makes schooling free for all its children even when physical defects of this nature forbid their attendance upon the public day school. These comprise the American School for the Deaf at Hartford, Conn.; the Clarke School for the Deaf, Northampton; the Horace Mann School for the Deaf, Boston; the Sarah Fuller Home for Little Deaf Children, Medford; the New England Industrial School for Deaf Mutes, Beverly; and the Boston School for the Deaf.

The penal and reformatory institutions include the Lyman School for Boys at Westborough; the State Industrial School for Girls at Lancaster, both controlled by trustees appointed by the governor; the State Prison at Boston (Charlestown District); the Massachusetts Reformatory at Concord; and the Reformatory Prison for Women at Sherborn, all controlled by the State Board of Prison Commissioners.

The State institutions for paupers include the State Hospital at Tewksbury and the State Farm at Bridgewater.

The local poor, having settlements under the law in the cities and towns, are cared for in local almshouses maintained by the municipalities. There are jails, houses of correction, and truant schools in the counties. The charitable institutions established and maintained by religious bodies or other private agencies are widely distributed; and, especially, hospitals for the treatment of accidents and disease, and homes for the aged have, in recent years, been numerously established throughout the Commonwealth.

By the latest published returns, covering the year 1902, the total number of paupers of all classes is 13,684, including 4,140 State poor, 5,044 city and town poor in local almshouses, and 4,590 pauper insane. The total cost of pauper maintenance for the year was $3,743,134, or $1.266 to each inhabitant of the State. For the same year the whole number of insane persons in the State was 9,386, distributed as follows: in public institutions, 8,271; in private institutions, 265; boarded out, 124; under the charge of overseers of the poor in local almshouses and private families, 726. (See PAUPERISM.)

The total prison population 30 Sept. 1909 aggregated 7,263; of whom about one half were confined in county jails and houses of correction, and the rest in the State prisons.

Vital Statistics.— Upon the estimated population of the State, the birth rate per 1,000 of persons living, for the year 1901, the latest for which complete figures are available, was 25.07; the marriage rate 8.67; and the death rate 16.82, the excess of births over death per 1,000 of persons living being 8.26. The death rate is slightly higher in the cities than in the towns. The total number of deaths for the year was 48,275, the number under each of the principal classified causes being as follows: from general diseases, 13,930; diseases of the nervous system and organs of special sense, 6,517; of the circulatory apparatus, 4,891; of the respiratory apparatus, 6,876; and of the digestive apparatus, 5,438.

Manufactures.— The State is largely devoted to manufacturing, the energies of its people having been early turned in this direction, and developed by more than a century of industrial training. No special advantages exist based upon the possession of raw material, or due to natural resources, except water power, which, although changes in the methods of developing power render this less essential than formerly, is still an important factor. The climate of the southeastern part of the State is especially favorable to cotton spinning. In colonial days much was done to foster manufactures, invention has been promoted, and improved craftsmanship stimulated, and the effect has been significant throughout the industrial history of the State. The power loom, first constructed by Francis C. Lowell of Boston and Paul Moody of Amesbury, and put in operation at Waltham in 1814, revolutionized the cotton industry in the United States. The first cotton mill in the country was built at Beverly in 1788. As early as 1815 there were 57 cotton mills in the State with 46,650 spindles. The first attempt at woolen goods manufacture was at Rowley, in Essex County, in 1643, followed by more or less successful efforts in the same direction elsewhere in the State in the 17th and 18th centuries. The industrial history of Lowell, Lawrence, and Fall River is, in effect, the history of the growth of the factory system as applied to textiles in America. The boot and shoe industry developed from crude hand process of early times to the perfected factory operations of to-day, is interwoven with the story of the growth of Lynn, Haverhill, Brockton, and many smaller municipalities. The first printing done in the American colonies was at Cambridge in 1639; and from this small beginning onward the printing and publishing business has been important in the State. Much of the history of papermaking in the United States is the history of the industry in Massachusetts. The manufacture of india rubber goods in this country originated at Roxbury, now part of Boston, in 1833. Manufactures of metal, machinery of all kinds, wooden goods, jewelry, clothing, cordage, rattan and other furniture, have always been important.

In textiles, the most important industrial group shown in this table, the cotton industry leads with a product value of $111,125,175. The spindles employed in this industry number 7,784,687, increasing 1,960,169, or 33.7 per cent, since 1890, being 40.6 per cent of the total increase in the country. In 1900 Massachusetts had 41 per cent of all spindles and 39.8 per cent of all looms employed in the cotton factories of the United States, and was first in rank among the States in the manufacture of cotton goods. The State led all others in the manufacture of worsted goods, the annual product reaching $40,557,363; and in woolen goods, the product being $30,888,104. It also holds first place in the boot and shoe industry, the figures being shown in the table. It has long been first in the manufacture of fine writing papers, the value of this product in 1900 being $11,298,628, or 71.1 per cent of the total produced in the United States. The paper used by the national government for currency and bonds is produced within the borders of Pittsfield but near the Dalton line in a mill especially devoted to its manufacture. In the production of rubber boots and shoes the State ranks first, and in the manufacture of jewelry is preceded only by Rhode Island and New York. The labor employed in the factories of the State is highly skilled, its operations well organized, and its productive capacity correspondingly high. Labor difficulties have not been numerous nor protracted. The factory legislation, as a whole, is in advance of other States, and is well enforced, being supported by an effective public opinion. The laws against the employment of children are especially stringent, and such employment is reduced to small proportions. There exists an efficient State factory inspection department, with headquarters in the State House, and a corps of district inspectors covering all parts of the Commonwealth.

The following table shows the returns, according to the census of 1900, of all industries in the aggregate and of the principal industries in detail:

Industries	Number of Establishments	Capital	Wage Earners		Value of Product
			Average Number	Total Wages	
All industries	31,982	$840,281,127	499,746	$229,343,215	$1,038,196,393
Boots and shoes (factory product)	640	37,577,630	58,645	27,745,820	117,115,243
Boots and shoes (cut stock)	270	5,475,277	4,390	1,699,807	18,238,922
Boots and shoes (rubber)	6	13,157,321	5,250	2,456,305	16,490,015
Carriages and wagons	388	5,594,939	3,164	1,709,164	6,118,121
Clothing	313	5,410,165	6,776	2,505,280	15,032,604
Confectionery	249	2,212,389	2,942	1,046,114	7,014,532
Cordage and twine	19	7,697,434	3,303	1,100,990	9,635 571
Electrical apparatus and supplies	54	8,259,612	5,202	2,714,449	10,490,361
Foundry and machine-shop products	825	62,498,989	32,234	17,862,854	56,290,159
Furniture, factory product	120	10,987,220	6,092	2,925,331	11,244,503
Iron and steel	8	13,738,593	6,125	3,408,827	13,491,159
Jewelry	138	4,917,105	5,696	2,780,993	10,315,334
Leather	119	15,317,940	7,010	3,379,698	26,067,714
Liquors, malt	40	18,136,623	1,651	1,340,412	11,255,613
Lumber	696	10,373,208	5,202	2,559,154	12,818,511
Paper and wood pulp	93	26,692,922	9,061	3,938,400	22,141,461
Printing and publishing	981	19,325,956	10,859	6,675,723	28,964,680
Rubber and elastic goods	70	11,818,650	5,944	2,401,954	13,885,059
Slaughtering and meat packing	22	11,314,075	2,748	1,318,077	31,633,483
Textiles	512	274,332,129	149,346	55,946,858	214,600,980

Agriculture.— The agriculture of the State, as compared with that of the great farming States of the West, is not important. The industry has always been secondary to manufacturing. Following the lines of least resistance, it has turned chiefly to the production of milk, eggs, poultry, and such vegetables as find a ready market in the growing factory towns and cities almost at the farmer's door. Considered from this standpoint and measured by the value of the product annually sold, no decline is shown in recent as compared with earlier years. For example, the total value of product for the year covered by the United States census of 1900 was $42,298,274, as against $28,072,900 returned 10 years previously. The returns in the State census are more favorable than those secured in the national enumeration, since taken in the autumn and possibly with greater care; but inasmuch as comparisons with other States can only be made by using the national figures, they will be relied on here. The total number of farms (1910) is 36,512; and the total acreage 2,870,000, of which 1,162,000 is improved. The farm property is valued as follows: Land and improvements, except buildings, $191,298,000; buildings, $87,025,000; implements and machinery, $11,512,000; live stock, $20,734,461. The animals upon the farms in the State, 15 April 1910, included 252,357 neat cattle; 64,233 horses; 9,997 lambs (under 1 year); 22,672 sheep (1 year and over); 102,913 swine; and poultry valued at $1,493,436. The total value of domestic animals on farms was $19,201,342. The persons engaged in agriculture in 1900, not including lumbermen and woodchoppers, numbered 63,692, those classed as agricultural laborers numbering 31,515. The farms operated by owners constituted 90.7 per cent of the whole number, only 9.3 per cent being carried on by tenant farmers. Of the families residing on farms, 84.9 per cent resided on owned farms. The amount expended during the year for farm labor aggregated $7,487,280. The farms classified upon the basis of the principal source of income are as follows: Hay and grain, 3,284; vegetables, 3,117; fruits, 1,286; live stock, 8,193; dairy produce, 14,900; tobacco, 632; flowers and plants, 597; nursery products, 49; miscellaneous, 5,657. The State ranks seventh among the States with respect to the number of farms which derive their principal income from dairy produce. The total dairy product for the year amounted to $12,855,744, the amount sold being $11,468,784, the remainder being consumed on the farms. The value of milk sold was $9,711,380; cream, $870,833; butter, $884,575; and of cheese, $1,996. The total value of poultry raised during the year was $1,407,681; and the egg product aggregated 12,928,630 dozen. About 60,000 acres were devoted to cereals, the product in 1910 being valued at but $1,852,000, only a small per cent of the total crop value. Of the principal cereals the acreage and bushels produced in 1910 are: Corn, 50,000 acres, 2,275,000 bushels; oats, 7,000 acres, 248,000 bushels; rye, 5,000 acres, 85,000 bushels; barley, 638 acres, 14,987 bushels; buckwheat, 3,000 acres, 66,000 bushels; wheat, 95 acres, 1,750 bushels. The acreage devoted to hay and forage crops, exclusive of cornstalks, was 590,000, and the tons produced, 755,000. Certain sections of the State are devoted to special products of considerable importance. Among these are tobacco raised in the Connecticut Valley, cranberries in Barnstable County, and general market produce in parts of Middlesex County near Boston.

The Fisheries.— The fishing industry has, from the earliest years, been an important element in the prosperity of the coast towns and the hardy seamen of Gloucester and Marblehead, engaged in this industry in times of peace, have won renown in the naval operations of the country in times of war. The latest complete returns relating to the fisheries of the State show a working capital invested, including apparatus and supplies, of $5,338,828, and the following annual product: Food fish, $4,647,914; fish products, $122,327; food fish products, $9,923; shell fish, $546,351; whale and seal products, $351,613; other products, $25,015; aggregating $5,703,143. The total number of fishermen is returned as 11,093, including officers and crew. Of the investment, 60.84 per cent, and of the product, 56.34 per cent, is credited to the city of Gloucester; New Bedford having 10.24 per cent of the investment and 5.49 per cent of the product; Provincetown, 6.17 per cent of the investment and 7.62 per cent of the product; Boston, 5.43 per cent of the investment and 8.92 per cent of the product; and the remainder being distributed among a number of other cities and towns.

Commerce.— By the latest statistics, the investments in coastwise and ocean commerce under the American flag include in an aggregate of $14,394,432, the following details: Buildings and fixtures, $313,235; cash capital, $1,150,870; credit capital, $94,040; land, $352,414; vessels, including outfit, $12,220,132; and wharves, $263,741. These figures are undoubtedly below the actual, owing to deficiencies in the returns, and to the natural increase since they were secured. The same statement applies to earnings which are returned as follows: From freight, $7,253,503; from passengers, $2,085,818; aggregating $9,339,321.

Boston, of course, is the chief port of entry, and in the aggregate value of investments and earnings derived from ocean commerce exceeds all others. The city is extensively engaged in European commerce, much of which is conducted under foreign flags. Lines of passenger and freight steamers regularly ply between Boston and European ports, and the coastwise passenger and freight traffic to the east and south is important. For the year covered by the previous returns, the commerce, under foreign flags, credited to Boston, included 61 vessels, the aggregate investment being $14,464,000; and the earnings from freight, $4,775,985; from passengers, $1,238,089; in the aggregate, $6,014,074.

Railroads.—Transportation facilities have kept pace with the industrial development of the State. Boston, the metropolis, is connected with the West by two railway systems, and these communicate either directly or by branches with all the leading industrial centres. One general system, with its various divisions, communicates with the South by way of New York, uniting important manufacturing cities and towns, while a network of main and branch lines connects the northern and eastern factory centres of the State with each other, with the seaboard, and with the railway systems leading south and west. There are in the State 2,107 miles of main and branch railroad line, besides 939 miles of second, third, and fourth main track, and 1,391 miles of side track, making the total length of railroad track within the State 4,437 miles. Ten companies in all are operating, but three of these, the Boston and Albany (New York Central and Hudson River, lessee), Boston and Maine, and the New York, New Haven and Hartford, operate over 96 per cent of the railroad mileage, and conduct nearly 98 per cent of the entire passenger and freight traffic. The gross assets of the companies, 30 June 1902, aggregated $418,298,274, and the gross liabilities, $383,106,669. The total income for the year aggregated $99,375,022, and the total expenditures $98,757,945, including dividend payments. Electric street railways have multiplied during the last 10 years, and they now connect all of the principal cities and towns. In the city of Boston subway and elevated railway construction of the highest class, completed and in process, has already transformed the methods of street transit, and will finally solve the problem of rapid communication between different parts of the city and its suburbs. The Massachusetts street railway companies now own, according to the latest published returns, 2,111 miles of main track, 333 miles of second main track, and 147 miles of side track, these aggregating 2,591 miles. The gross assets of these companies aggregate $123,200,558, and the gross liabilities, $119,441,792. The total income for the year amounted to $24,918,161, and the total expenditures to $24,668,021.

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Horace G. Wadlin,
Librarian, Boston Public Library.

Massachusetts Agricultural College, at Amherst, Mass., a coeducational institution, chartered in 1863 and opened in 1867 by the State. The college farm is 400 acres in extent, about 100 acres of which are devoted to horticulture, and 200 acres to farming. The work is experimental on the part of the students. The regular course extends over four years, but special courses are given for women desiring to study dairying, market gardening and some other subjects. Winter courses are provided for those unable to take the four years' work. The regular courses lead to the degrees B.S., M.S., and Ph.D. In 1910, the number of instructors was 62 and the students in attendance about 590. The library had about 33,000 volumes; the buildings and grounds were valued at $450,000 and the equipment at $115,000.

Massachusetts Bay, an arm of the Atlantic indenting the eastern shore of Massachusetts, and extending from Plymouth Harbor on the south to Cape Ann on the north, a distance of 42 miles. It is triangular in shape, the north and south shores inclining toward each other until at the entrance to Boston Harbor they are about five miles apart. The depth from the base of the triangle to Boston Harbor is about 21 miles. The northern shore is rocky and irregular, the southern low and sandy. The principal inlets are: on the north coast, Gloucester and Nahant bays and Salem, Marblehead and Lynn harbors, and on the west Boston Harbor. Along the shores are a number of capes and headlands, and off the coast a number of small islands. At the entrance to Boston Harbor there are several islands, on some of which are fortifications. Cape Cod Bay on the southeast is sometimes included in Massachusetts Bay.

Massachusetts Bay Colony. See Massachusetts, *History*.

Massachusetts Historical Society. See American Historical Societies.

Massachusetts Institute of Technology, The, was founded in 1865, at the close of the Civil War, when the need was beginning to be felt for schools which should train men to deal with the new industrial problems. It was the plan of President Rogers, and of his co-workers, to establish a school which should give a thoroughly practical training in the application of scientific principles to practice in the arts, but not primarily training in mere technics, in the narrow sense. Accordingly they planned that each of its courses should embrace enough general studies to impart the elements, at least, of a liberal education; and, above all, they laid down that the most truly practical training, even in an industrial sense, must be grounded in a thorough knowledge of scientific laws.

Founded on these principles, the Institute of Technology began a career of steady development. To-day it is the largest school of its class in the United States, the widest in scope of instruction, and in many respects the best equipped. The total number of its students, in 1910 was 1,481, the total number of instructors 231. The number of volumes in the library was 87,000. Though 58 per cent of the students come from Massachusetts, among the remainder are found residents of 41 States of the Union, and of 18 foreign countries. In all 43 classes have graduated, aggregating over 4,605 persons. Except in seasons of financial depression, the demand for these graduates is always in excess of the supply.

The undergraduate studies of the school are divided into 13 distinct courses, each of four years' duration, and leading to the degree of Bachelor of Science. The four-year courses are Civil Engineering, Mechanical Engineering, Mining Engineering, Metallurgy, Architecture, Chemistry, Electrical Engineering, Biology, Physics, General Studies, Chemical Engineering, Sanitary Engineering, Geology, and Naval Architecture. Between the departments which maintain these several courses there is the closest connection and mutual support. Consequently, the instruction is specialized to a degree which would be impossible in a smaller college, with a less numerous staff of instructors. Again, the instructors, though connected in a special sense with one department, are giving instruction, it may be, to students from many others. This mutual helpfulness of the departments is seen first in the fundamental subjects, such as chemistry in the first year, and physics in the second, which are given to several courses or to all. It is seen again, in the large number of optional lines of work offered. Within most of the regular courses the student is allowed considerable latitude of choice, in the later years of his study, and may thus select that group of studies which is best adapted to the particular branch of his profession for which he is preparing.

The Institute occupies at present eight buildings devoted exclusively to instruction. The most interesting aspect of the equipment is the extensive laboratories. Many of them, when first instituted, represented an attempt to apply the laboratory method in a way up to that time unknown in the history of scientific instruction in this country. The laboratories of physics and of chemistry were the first to offer laboratory instruction in these subjects to students in large classes; and the mining and metallurgical laboratories, the steam laboratory, and the laboratory for testing the strength of materials also represent a marked advance over previous methods, either in the subjects taught or in the scale on which the work is done.

The extensive and highly specialized equipment of these laboratories cannot here be adequately described. In the 21 separate laboratories devoted to chemistry, for instance, there are, besides the larger general laboratories, smaller rooms for volumetric analysis, organic chemistry, air, water and food analysis, the analysis of oils and gases, the optical and the chemical examination of sugars and starches, and the determination of molecular weights. There are also the industrial chemical laboratories, which include a special laboratory for textile coloring, with printing machines, baths, dryers, and the like. The engineering laboratories, which provide facilities for practical work in steam engineering, hydraulics, cotton machinery, and the testing of materials, occupy a floor space of 21,380 square feet. The equipment of the steam laboratory, to speak of that alone, is exceptional, including a 150-horse-power, triple-expansion Corliss engine, the first of its kind of practical size ever arranged for experimental purposes; a second engine of 225 horse-power, transferring its power through a rope drive; a number of small engines for experiments and the study of valve-setting; gas engines, hot air engines, and other apparatus. The new Lowell Laboratory of Electrical Engineering covers an area of 45,000 square feet, and embraces a laboratory for electrical measurements, photometer rooms, and a main power and testing floor 300 feet in length by 40 feet in width. The new laboratory offers facilities for instruction and research which are unsurpassed in this country or abroad.

With this unusual laboratory equipment, it has been possible for the Institute to do much of its experimental work on a scale approaching that of industrial operations. The laboratories of mining and metallurgy, for instance, are designed to treat ores in quantities approximating those used in actual practice, and ranging from 500 pounds to 3 tons, and the contributions to the literature of ore-dressing and metallurgy from this laboratory are well known. In the laboratory for testing the strength of materials, again, were conducted the first systematic and extended tests of beams of commercial size.

Throughout all the work of the Institute the aim of instruction is so to adjust the theoretical and experimental work that the acquirement of principles in the class-room shall prepare the student for his laboratory exercises, and that these in turn shall fix methods and results in his memory, and give him capacity for new experimentation. Throughout it is intended to guide the student rather than to instruct him, and, whether in the four-year courses above described or in the graduate courses with which these may be supplemented, he is trained to work with less and less dependence upon his teachers. This training should result in a considerable increase in his power of ascertaining facts and overcoming difficulties, and so should increase his capacity for research.

N. I. Tyler,
Secretary Massachusetts Institute of Technology.

Massage, a procedure, usually performed by the hands, such as friction, kneading, rolling, and percussion of the external tissues of the body, either to relieve pain or to assist a cure, or with some hygienic object in view. A male massagist is known as a masseur, a female as a masseuse. Massage in some crude form has always been used by savages as well as by the civilized. It was one of the luxuries of the ancient Greeks and Romans, was largely used by gladiators, and to make slaves more comely by filling out their tissues. Sometimes it was done by medical practitioners, often by slaves and priests and those appointed to anoint the wrestlers before and after they exercised. Hippocrates, who employed rubbing to restore the free movement of blood and other fluids, says that "rubbing can bind and loosen, can make flesh, and cause parts to waste; hard rubbing binds; soft rubbing loosens; much rubbing causes parts to waste; moderate rubbing makes them grow." Manual treatment of the body was long ago practised by the Chinese, and the Japanese, Turks, Egyptians, and people of various nationalities have employed it in some form from early times.

Often the use of massage is associated with that of certain active and passive movements known as the Swedish movement-cure (q.v.), established by Pehr Henrik Ling (q.v.). His system of gymnastics became popular in spite of opposition and of the fact that it was largely a revival of old methods of treatment. In 1873 Mezger, of Amsterdam, and in 1877 S. Weir Mitchell of Philadelphia, pushed forward the cause of massage. To-day it is considered by physicians as a branch of medical treatment, useful in certain cases if rightly administered, but capable of doing harm when improperly applied. Unfortunately the laity frequently look upon it as a sole means of relief or cure. The procedures in massage may be placed under four heads: stroking (the *effleurage* of the French), kneading (malaxation), friction, and percussion. Stroking is performed over surfaces with the palm of the hand or its radial border, or with the pulps of the fingers, or the sides of the knuckles. Kneading is the grasping of muscles, etc., with both hands or between the thumb and fingers of one hand, and rolling and squeezing them. Friction is a peculiar and forcible circular rubbing. Percussion is the striking or beating of a part, either with the hand or an instrument called a percussor or muscle-beater. It is claimed that the modern system of massage makes the blood circulate more freely, strengthens muscle-fibres, causes effusions and exudations to be absorbed, improves secretory and excretory action, and invigorates the whole system. It is frequently used with good results to stimulate assimilation and invigorate digestion, to soothe nervous irritability, relieve pain, and arouse nerve-force, to equalize the circulation, to remove morbid deposits from around joints, to restore mobility, and for the correction of obstinate constipation and other disordered conditions.

Massagetæ, mạ-săj'ĕ-tē, in ancient history, a name given to nomadic tribes of northern Asia who dwelt to the east and south of the Caspian Sea. Herodotus says they worshipped and offered horses to the sun, had a community of wives, killed and ate their aged people, lived chiefly on the milk and flesh of their herds and on fish, and fought on foot and on horseback with lance, bow, and double-edged axe. They are chiefly mentioned in connection with Persian history. According to some they belonged to the Mongolian stock, according to others to the Aryan.

Massasoit, măs'ạ-soit, American Indian chief, sachem of the Wampanoags: b. Massachusetts 1580; d. 1661. His dominion extended over nearly all the southern part of Massachusetts, from Cape Cod to Narraganset Bay; but his tribe, once estimated at 30,000 in number, had shortly before the landing of the pilgrims at Plymouth been reduced by a disease, supposed to have been yellow fever, to barely 300. On 22 March 1621, a little more than three months after the founding of Plymouth, he appeared before the infant settlement with 60 of his warriors, armed and painted, for the purpose of forming a friendly league with the white men. Although the tribe were reputed to be cruel and treacherous, the open and friendly greeting of Massasoit so favorably impressed Gov. Carver, that after the necessary formalities were concluded, he formed in behalf of the colony a treaty of peace and mutual protection with the Wampanoags, which for 50 years was sacredly kept by both parties. The friendly disposition of Massasoit toward the colonists never relaxed. He lived within the limits of what is now the town of Warren, R. I., near an abundant spring which yet bears his name, where he often entertained wandering pilgrims or administered to their necessities. Roger Williams, while on his way to Providence, was for several weeks his guest at this place. Massasoit was just, humane, and honest, never violating his word and constantly endeavoring to imbue his people with a love of peace. In person, Morton says, in his ‹Memorial,› he was «a portly man in his best years, grave of countenance, spare of speech.» His second son, Pometacom, called by the colonists King Philip, who ultimately became sachem of the Wampanoags, was of a less placable disposition, and allowed the encroachments of the colonists to hurry him into the bloody contest known as King Philip's war.

Massassauga, măs-ạ-sâ'ga, the ground rattlesnake of the central United States. See RATTLESNAKE.

Masséna, André, äṅ-drā mä-sā-nä, marshal of France: b. Leven near Nice, France, 6 May 1758; d. 4 April 1817. In 1775 he entered the French army and after 14 years' service left the army and returned to Nice, where he married. During the Revolution he entered a battalion of volunteers, and in 1793 was made general of brigade. In 1794 he took command of the right wing of the French army in Italy, where, at Rivoli and elsewhere, he highly distinguished himself. In 1799 he defeated the Austrian and Russian forces at Zürich, and in 1800, by his defense of Genoa for three months, gave Bonaparte time to strike successfully at Marengo. In 1804 he was created marshal of the empire. In 1805 he received the chief command in Italy, where after the Peace of Presburg he occupied the kingdom of Naples. In 1807 he was given the command of the right wing of the French army in Poland, and soon after received the title of Duke of Rivoli. In 1809 he distinguished himself against the Austrians, and at Esslingen his constancy and firmness saved the French army from total destruction. Napoleon rewarded him with the dignity of Prince of Esslingen. In 1810 he took command of the army in Portugal, and forced Wellington within the lines of Torres Vedras, till want of provisions compelled Masséna to retire. In 1814 he was made a peer by Louis XVIII., and though on the return of the emperor he acknowledged his authority, took no active part in the events of the Hundred Days.

Massena, mā-sē'nạ, N. Y., village, in Saint Lawrence County; on the Grasse River, and on the New York C. & H. R. and the Grand T. R.R.'s; about 35 miles northeast of Ogdensburg. It was settled by people from Vermont, about 1802, and was incorporated as a village in 1886. It is situated in a rich agricultural region, in which the chief products are hay, potatoes, dairy products, and apples. Massena Springs, just outside the village limits, is one with the village in commercial and industrial interests, and is a famous resort on account of its medicinal springs. Great opportunities for manufacturing are afforded by the plant of the Saint Lawrence River Power Company, which has a capacity of 40,000 horse-power, and which can easily be increased. This power has been secured by diverting a small portion of the waters of the Saint Lawrence River through a canal, three miles long, into turbines, which have direct connection with electric generators, and thence into the Grasse River.

The canal starts at the head of the Long Sault rapids in the Saint Lawrence, and is 200 feet wide and 18 feet in depth. Owing to the peculiar formation of the country here, the point at the head of the rapids is 45 feet higher than the point where the canal enters the Grasse River, which is a tributary of the Saint Lawrence. The Grasse acts as a tail race, carrying the water back into the Saint Lawrence. Two bridges span the canal. By using the Grasse River and the canal there is now a passage wholly within the United States for steamers around the unnavigable rapids. The power plant at Massena is second only to Niagara as a centralized power supply station. The chief industrial establishments are reduction works, which employ 300 men; veneering works, employing 100; mineral filler works, 30 employees; sash and door works, 20 employees. Other manufactories are under consideration. There are seven churches, two banks, a high school, and public schools. Massena is the business centre for a population of 60,000. Pop. (1890) 1,049; (1900) 2,032; (1910) 2,951.

Massenet, Jules Frédéric Emile, zhül frā-dā-rēk ā-mēl mäs-nā, French composer: b. Montaud, near St. Etienne, France, 12 May 1842. He studied at the Paris Conservatoire, in which in 1878 he became professor of composition. His first important work was the opera ‹Don César de Bazan› (1872), which was followed by ‹Les Erinnyes› (1873); an oratorio ‹Marie Madeleine› (1873); and an oratorio ‹Eve› produced in 1875. Later works of his are: The opera ‹Le Roi de Lahore›; the cantata ‹Narcisse›; ‹La Vierge› (1879); ‹Hérodiade,› a religious opera (1881); ‹Manon Lescaut,› an opera (1884); ‹Le Cid› (1885); ‹Esclarmonde› (1889); ‹Werther› (1892); ‹Thaïs› (1894); ‹Sappho.› Massenet's earlier works, such as ‹Marie Madeleine,› are still among his best. The promise contained in them has not been fulfilled in his later productions, in many of which genuine musical feeling is sacrificed to the tricks that secure popularity.

Massey, mas'ĭ, **Gerald,** English poet: b. near Tring, Hertfordshire, 29 May 1828; d. 29 Oct. 1907. He received but little education, and at 8 was employed in a silk factory. Going to London about 1843, he became an errand boy, and in 1849 editor of ‹The Spirit of Freedom,› a Radical paper, becoming at the same time associated with Kingsley, Maurice, and other Christian Socialists. In 1854 he published ‹Ballad of Babe Christabel,› and other poems. The volume attracted the notice of Landor, and the poems issued in succession to it met with no little popularity. Other books of his are: ‹The Secret Drama of Shakspere's Sonnets› (1864–72); ‹A Tale of Eternity and other Poems› (1869); ‹Concerning Spiritualism’ (1872); ‘A Book of the Beginnings’ (1882); ‘The Natural Genesis’ (1883); ‘My Lyrical Life,’ a collection of poems (1889). For some years he lectured at home and in the United States and Australia on spiritualism and various social and socialistic subjects.

Massillon, Jean Baptiste, zhŏṅ ba-tēst mä-sē-yôṅ, French preacher: b. Hyères, Provence, 24 June 1663; d. Clermont 18 Sept. 1742. In 1681 he entered the Congregation of the Oratory; then taught theology at Montbrisom and Vienne; went to Paris in 1696 as director of the Seminary of St. Maloire; and won great favor, even at court, by his eloquent and searching sermons. His funeral orations are particularly famous. In 1718 he was appointed preacher to Louis XV., then only 9 years old, and for him composed the ‘Petite Carême,’ a notable series of sermons. Massillon was elected to the French Academy in 1719; in the same year he retired from Paris to Clermont, where he died of apoplexy. His works were edited in 1886 by Blampiguan, whose biographical sketch, ‘Massillon d’après des Documents inédits’ (1879), should be consulted.

Massillon, măs'ĭl-ŏn, Ohio, city, in Stark County; on the Tuscarawas River, the Ohio Canal, and on the Wheeling & L. E., the Pennsylvania, and the Cleveland, L. & W. R.R. s; about 100 miles in direct line northeast of Columbus and 8 miles west of Canton. Massillon was established in 1825, and in 1853 was incorporated as a village; the city charter was granted in 1868.

It is situated in the Tuscarawas Valley, noted for its large bituminous coal fields and for its excellent farm lands. In the vicinity of the city are quarries of white sandstone. Some of the industrial establishments are foundries, rolling-mills, machine-shops, bridge works, potteries, glass-works, steel tubing, furnaces, flour-mills, and creameries. In addition to the manufactures of the city there is a large trade in coal, sandstone, grain, and live-stock. The State Hospital and Asylum for the Insane is in Massillon. The city has a number of fine buildings, chief among them are the churches and schools. The government is administered under the charter of 1868, its first charter, and is vested in a mayor, who holds office two years, and a council. The board of education is chosen by popular vote; the boards of health and equalization are elected by the council. Other administrative officials are appointed by the board subject to the approval of the council. Pop. (1900) 11,944; (1910) 13,879.

Massinger, măs'ĭn-jėr, **Philip,** English dramatist: b. Salisbury 1583; d. Southwark, London, March 1640. He studied at St. Alban Hall, Oxford, went to London in 1606, and soon became a well-known playwright. He collaborated with Nathaniel Field, Thomas Dekker, Cyril Tourneur, and Robert Daborne, and regularly with Fletcher in 1613–25. Independently, he wrote 15 plays, including comedies, tragedies, and tragi-comedies. They are frequently based closely on Italian and Spanish originals, but show much skilfulness in the development of plot, and a knowledge of the requirements imposed by stage presentation. ‘Henry VIII.’ in its present form was probably written by him with Fletcher. Among the plays wholly by him are: ‘The Bondman’ (1624); ‘The Roman Actor’ (1629); ‘A New Way to Pay Old Debts’ (1632); ‘The Guardian’ (1655). ‘A New Way to Pay Old Debts’ kept the stage in England to the end of the 19th century. There is an edition of his plays by Cunningham (1867); and of ‘Selections’ by Symon (1887–9). Consult Fleay, ‘Biographical History of the English Drama.’

Masson, măs'on, **David,** Scottish critic: b. Aberdeen 2 Dec. 1822; d. Edinburgh 7 Oct. 1907. He was educated at Marischal College and Edinburgh University; in 1852 was appointed to succeed Clough in the chair of English language and literature at University College, London. He was editor of ‘Macmillan’s Magazine’ 1859–68, and was professor of rhetoric and English literature in the University of Edinburgh 1865–95. He is best known for his elaborate and comprehensive study of Milton’s life and times (six volumes, 1858–80) — a work valuable alike as a contribution to English history and to the history of English literature. Other works by him are: ‘British Novelists and their Styles’ (1859); ‘Recent British Philosophy’ (1865); ‘Drummond of Hawthornden’ (1873); ‘The Three Devils — Luther’s, Milton’s, and Goethe’s (1874). He also published the Cambridge edition of Milton’s Poems with introductions, notes, and an essay on Milton’s English (1877); ‘De Quincey’ in ‘English Men of Letters’ series (1878); an edition of De Quincey’s works (14 vols. 1889–91); and ‘Edinburgh Sketches and Memories’ (1892). In 1893 he was appointed Historiographer-Royal for Scotland.

Masson, Frédéric, frā-dā-rēk mă-sôn, French historian: b. 1847. He was librarian in the archives of the foreign office, and after the overthrow of the Empire became secretary to Prince Napoleon, and was entrusted with the arrangement of the Prince’s papers and collections. He is known as the author of nearly 20 volumes in a still incomplete series of works on Napoleon I. His method is anecdotic, and he has based his statements on original documents, — correspondence, account- and note-books, and the like, many of which he himself owns in his large collection of Napoleonic material Among the titles of his studies are: ‘Napoleon at Home’; ‘Napoleon in Campaign’: ‘War Adventures’; ‘Napoleon’s Cavaliers.’ In 1903 he was elected to the Académie Française to succeed Gaston Paris.

Mas'sorah, măs-sō'rä. See Masora.

Massowah, măs-sow'ä, or **Massawa,** northeast Africa, a seaport and the principal town of the Italian colony of Eritrea, on a small coral island in the Red Sea, at the northern end of Arkeeko Bay, connected with the mainland by a causeway. The town is built of stone, is defended by several forts, and is supplied with water from the neighboring M’Kulu heights. The town is hot and unhealthful, but the M’Kulu hills have a much better climate. A railway 17 miles long connects with Saati inland. The chief imports are grain and flour, cotton manufactures, glass-wares, arms, cutlery, spices, wines, and spirits; principal exports, rhinoceros-horns, gold, ivory, honey, pearls, gums, skins, and wax, brought by caravans from the interior. Formerly dependent on Egypt, the town and strip of coast were ceded to Italy in

1885. Pop. (1899) 7,775, including 600 Europeans and 480 Asiatics.

Massys, mäs-sīs'. See MATSYS, QUENTIN.

Mas'taba, an Arabic word meaning bench, applied to certain Egyptian tombs which were common under the Memphite dynasties. Remains of hundreds of these tombs still exist. They are in size from 18 by 26 feet to 85 by 172 feet. They are oblong, bench-like structures, with flat roofs of stone slabs.

Master and Servant. See LAW OF FAMILY.

Master of Arts (M.A. or A.M., *artium magister*), an academical honor conferred by universities of the United States, Great Britain and other countries, upon students after a course of study and a previous examination in the chief branches of a liberal education, particularly philosophy, philology, mathematics, physics, and history. The word *magister*, connected with a qualifying phrase, was used among the Romans as a title of honor; but its present meaning must be traced to the time of the establishment of the oldest universities. Regularly organized faculties were not then known as they now exist in the universities. The whole circle of academic activity was limited to the seven liberal arts (see ART); and they who received public honors on the completion of their course of studies, for their diligence and knowledge, and had already received the degree of *baccalaureus* (bachelor), were called *magistri artium* (masters of the liberal arts). In American and English universities this degree follows that of Bachelor. The degree of Master of Arts is inferior to that of Doctor of Letters (D. Litt.). In the German universities the title was formerly conferred, but has been superseded by that of Doctor of Philosophy (Ph.D.), which practically corresponds to the degree of M.A. in other universities. This title is an indispensable preliminary to the attainment of the position of *docent* in the German universities, that is, one who has obtained the right to deliver academical lectures.

Master of Ballantrae, băl-ạn-trā', **The,** a novel by Robert Louis Stevenson, published in 1889. It is a Scottish romance of the 18th century, beginning with the Stuart uprising of 1745. It is a sombre tragedy of the enmity of two brothers, of whom the elder, James Durrie the Master, takes the side of the Stuarts, the younger, Henry, that of King George.

Master Singers. See MEISTERSINGERS.

Mas'terwort, the rustic name of several umbelliferous plants, as those of the genus *Anethum* (see DILL), formerly much cultivated as pot-herbs, and held in great repute as a stomachic, sudorific, diuretic, etc. The edible root has a pungent taste, causes a flow of saliva and a sensation of warmth in the mouth, and often affords relief in toothache.

Mas'tic Gum, or **Mastiche,** a resinous substance flowing from deep incisions made in the branches of the *Pistachia lentiscus*, a shrub of the terebinth family growing in the countries bordering on the eastern Mediterranean. This tree attains the height of 15 or 20 feet; the leaves are alternate and pinnate; the flowers are small, inconspicuous, disposed in axillary racemes, and are succeeded by an ovoid drupe containing an osseous nut. It forms one of the most important products of Scio, and other Ægean islands, where it has been cultivated from remote antiquity. Heat seems to exercise a great influence on the resinous product. Mastic is consumed as a chewing-gum in vast quantities throughout the Turkish empire by women of all classes, for the purpose of cleansing the teeth and imparting an agreeable odor to the breath. It is related to myrrh, frankincense, etc., and was formerly in repute as a medicine throughout Europe, but at the present time is chiefly useful in the arts as a varnish for maps, drawings, etc.

Mastica'tion, or **Chewing,** the thorough subdivision of food in the mouth so that it can be readily acted upon by the gastric juice and other digestive secretions. It is the first step in the process of digestion, and is effected by the joint action of the teeth, jaws, tongue, cheeks, and lips. The three last named push the food material between the teeth, and by the lateral and up-and-down motions of the lower jaw it is cut and torn by the incisor, canine, and bicuspid teeth and bruised by the molar or grinding teeth. In the act of mastication the temporal and masseter muscles close the mouth, the mylohyoid and digastric open it, and the pterygoids produce the lateral movement of the lower jaw. These muscles operate by means of the inferior maxillary branches of the fifth pair of nerves. At the same time with the actions above described the food is softened by the saliva (insalivation), which exudes abundantly from the salivary glands by the act of mastication. Typical mastication is seen only in the higher vertebra. «The amphibian bolts its fly, the bird its grain, and the fish its brother without the ceremony of chewing,» but in man and the higher animals mastication is necessary for complete and comfortable digestion. The chemist, to dissolve a substance quickly and thoroughly, first pulverizes it in a mortar. Thorough comminution of food by mastication is analogous to the pulverizing process employed by the chemist, but associated with mastication is insalivation, as it is almost impossible to swallow substances which are very dry. Imperfect mastication of food, either by reason of rapid swallowing (bolting), or because of the absence of sound and serviceable teeth, is very frequently the cause of the numerous ailments classified under the term indigestion. Digestion in the stomach and small intestine is made difficult and more or less painful.

Mas'tiff, a breed of dogs of great size, recognized by the large head, the dependent lips, the broad, hanging ears, and by the general muscularity of the form. The mastiff in general disposition is affectionate and gentle, extremely faithful and vigilant. In Rome and in classical ages these dogs were held in high estimation for their strength and courage. The most valued breeds were obtained from Great Britain, where these dogs originated, and were used to guard flocks and herds; and watching has become instinctive with them. Roman officers were appointed to breed them and to transmit them periodically to Rome, where they fought lions, etc., in the arenas of the Roman amphitheatres and were otherwise favorites. The dog now is highly valued, both as a watch-dog, and as a domestic companion. Fawn is the prevalent color, and the weight should be about 165 pounds.

Mastigoph'ora, a class of Protozoa «in which the flagellate form is prominent although the amœboid and encysted conditions frequently occur.» Typical forms are contained in the order *Flagellata* (q.v.).

Mas'todon, a genus of fossil proboscidians of the elephant family, whose remains are found in all parts of the world in Tertiary formations from Miocene time onward to the dawn of the present era. Although in size and external appearance the larger mastodons much resembled modern elephants, save that, like the mammoths, the northern species were probably clothed with long hair, they differed widely from other genera of the family in details of structure, especially those affecting dentition. Thus milk-molars were present, and sometimes were persistent; and in their structure the fossil molar teeth are not penetrated by deep partitions of cement, and their crowns are marked by few (3 to 5) transverse ridges, which are often broken into nipple-like protuberances. This is, in short, the simplest form of tooth-structure in the family, of which the mastodons are the oldest and most primitive type, and nearest to the earlier *Dinotheria.* The tusks curved upward in growth, sometimes completing a circle. Their length in *Mastodon americanus,* whose remains have been obtained nearly entire from bog-deposits in various parts of the United States, was about 9 feet, indicating, as do the measurements of the skeleton, an animal about equal in average height to the modern Indian elephant, but with a rather more bulky body and a flatter forehead. Of this species several good skeletons are preserved in the museums of the United States and Canada, and certain European species are also well known. About 30 different kinds of mastodons have been described from bones found in almost every country in the world. What brought this widespread group to an end is not clear. There was no diminution in their food, which consisted of herbage, bark and leaves, as is known from undigested stomach-contents found within the skeletons; and they survived the historic vicissitudes of climates until subsequently the present settled conditions arrived. There is good reason to believe that they lasted in America, at least, until after the advent of mankind, but indisputable evidence of this is lacking.

Consult: Woodward, ‘Vertebrate Palæontology’ (1898); Lucas, ‘Animals before Man in North America’ (1902); ‘American Naturalist,’ Vol. XVI., pp. 75, 277 (1882).

Matabeleland, mă-tă-bă'lĕ-lănd, South Africa, the southeastern district of Rhodesia (q.v.) between the Limpopo and Zambesi, north of the Transvaal. In 1889 it came under the administration of the British South Africa Company, against whom the natives unsuccessfully rebelled in 1893 and in 1896. The Matabili are a war-like Kaffir race, who migrated from Natal in 1827 under their chief Umsilikatse. The country is traversed by ranges of hills, — the Matoppo Hills being the chief — is watered by numerous streams, has good pasture, and is believed to be rich in gold. It is now being rapidly settled and developed. Buluwayo is the capital.

Matachin, măt ạ chēn', or **Matachine,** «the dance of fools,» a former well-known comic dance performed by maskers in mock-military guise. It was common in France and Italy. The dance itself was merely a display of tumbling or acrobatic feats.

Matador'. in Spanish bullfights the man appointed to administer the fatal stroke to the bull. See BULL-FIGHT.

Matagalpa, mä-tä-gäl'pä, Nicaragua, town, capital of the department of Matagalpa, north of the central part of Nicaragua. It is situated in a fertile agricultural region, in which the chief products are tobacco, coffee, and sugar. The lack of railroads has been a hindrance to the growth of the town; but plans are formed for connecting it with the Pacific and with Namagua, the capital, and other cities. The inhabitants are mostly Indians. Pop. about 11,000.

Matamat'a, a large fresh-water turtle (*Chelys fimbriata*) of the Amazon and Orinoco valleys, which has a flat, weak, but heavily embossed shell, and lies in concealment among the weeds. Its neck is very long, the head is small, the nose is extended into a flat tubular proboscis, and the jaws are so weak and soft that it is evident nothing can be forcibly seized with them. Hence it is believed that the frogs, small fishes and the like, upon which this turtle feeds, are sucked into the throat rather than bitten. To facilitate its concealment against both enemies and expected prey, the head and neck of this remarkable creature are covered with an outgrowth of fleshy fringes, which float about in the water, like tangled weeds, hiding its identity most effectively. Consult Gadow, ‘Amphibia and Reptiles’ (1901).

Matamoros, Mariano, mä-rē-ä'nō mä-tä-mō'rōs, Mexican patriot: b. Mexico about 1770; d. Valladolid 3 Feb. 1814. He first appears in 1810 as substitute priest of the parish in Jantetelco, a village south of Mexico city. In 1811 he identified himself with the revolt of Hidalgo (q.v.), and became the principal commander under Morelos (q.v.). He attained the rank of lieutenant-general on 19 April 1813. On 14 Oct. 1813 he gained the victory of San Agustin del Palmar, and on 5 Jan. 1814 was captured at the defeat of Purwaran. He was executed in Valladolid market-place.

Matamoros, Mexico, a frontier town and river port opposite Brownsville, Texas, on the right bank of the Rio Grande del Norte, about 30 miles above its mouth in the Gulf of Mexico. It consists chiefly of brick houses; around the public square stand the church, town-house, custom-house, and a number of elegant private dwellings. A considerable trade is carried on with the United States; horses, hides, wool, etc., are exported, and manufactured goods imported. During the Mexican War in 1846 the town was occupied by American troops under General Taylor.

Matanzas, mă-tăn'zạs (Sp. mä-tän'thäs), Cuba, a seaport city on the north coast, capital of Matanzas Province, 52 miles by rail east of Havana. It is situated on Matanzas Bay, one of the largest, safest, and most convenient harbors of the Western hemisphere. The city is well-built with wide, regular, and paved streets, handsome plazas, and public buildings, and good railway communications. The caves of Bellamar, and Yumuri Valley, in the neighborhood, are two popular natural resorts. Matanzas ranks in importance next to Havana in the export of sugar, molasses, and coffee, the exports of sugar alone averaging annually about $15,000,000. The city was bombarded by the United States warships during the Spanish-American War in 1898, the only casualty, widely telegraphed, being an injury to a « Matanzas mule,» which made the animal famous.

Matapan, mä-tä-pän', **Cape.** See CAPE MATAPAN.

Match Industry. It was nearly 800 years after the discovery of phosphorus by an Arab, named Bechel, that it was found possible to obtain a light in a short time by the friction of phosphorus and sulphur. This discovery was made and first applied commercially in the latter part of the 17th century by Godfrey Haukwitz, of London, and, although the feasibility of producing a substance which, with a little rubbing, would ignite, was at once demonstrated, and, although it was proven that such a substance would be of immense commercial value, yet it was nearly a century and a quarter before a friction match was invented and successfully put on the market. The method employed by Haukwitz consisted of rubbing small particles of phosphorus between folds of brown paper and the flame produced lighted a sulphur match, but, as the phosphorus at that time was costly and considered dangerous, the match was not a success.

Among the earliest inventions was the « phosphorus bottle,» containing a piece of phosphorus, stirred about by a hot wire, in order to coat the bottle with oxide of phosphorus, and when a light was desired a sulphur match was thrust into the bottle and thus ignited. This « phosphorus bottle » was followed in 1805 by the «oxymuriate match,» the invention of Chancel, of Paris. These matches were, however, considered dangerous, and in 1809 a mixture of phosphorus and magnesia was invented by Derepos, which was designed to do away with the danger attendant upon the use of the others.

One of the first forms of matches used was the brimstone match, and this consisted of strips of resinous or very dry pine wood dipped in melted sulphur and lighted by means of a spark dropped from a flint and steel. This brimstone match was in almost universal use, despite the fact of later inventions, till the first part of the 19th century, and even as late as 1825, but with the general awakening at that time in all branches of industry the same progress was manifest in the invention of matches and of more ingenious machinery for making them. The first invention along this line came in shape of the « Instantaneous-Light Boxes,» called the Eupyrions and Prometheans, the invention of a Mr. Jones of London. These light boxes retailed at a very high price and were made of small sticks of dry wood tipped with a mixture of chlorate of potash and sulphur, which, when dipped into sulphuric acid, ignited. These were dangerous because of the acid and because of the liability of harm from the explosion when ignited, beside which the cost was prohibitive to general use. This was followed in 1827 by the Congreve match, invented by a chemist, named Walker, of Stockton-on-Tees. This match was similar to the « Instantaneous-Light Box,» but the mixture on the end consisted of gum, chlorate of potash, and sulphide of antimony, placed over a coat of sulphur. They were drawn between a fold of sandpaper to ignite them. These sold for a shilling per box, containing 84 matches. They did not become generally used because they did not readily ignite and the fumes created by the burning substances were very offensive.

In 1833 the lucifer friction match was put on the market and this differed materially from the « Instantaneous-Light Box,» at first being tipped substantially the same as the Congreve, but later having phosphorus as one of the ingredients of the mixture. The manufacture of these phosphorus matches was commenced on a large scale in 1833 at Vienna, by an Austrian named Treschel, and gradually several factories began to produce matches of various kinds, Austria and Southern Germany taking the lead in production. Red or amorphous phosphorus was discovered by Prof. Anton von Schrötter, a German, in 1845, and was used as early as 1855 by Lundstrom, of Jönköping, the first manufacturer of the well-known « safety-match.» In these matches the phosphorus is omitted from the composition placed on the tip of the match, but is placed on the side of the box, and thus the match will only ignite when rubbed on the box. On 24 Oct. 1836, Alonzo D. Phillips, of Springfield, Mass., was granted the first patent on friction matches given in the United States.

In the early days the greater portion of the matches made came from the poorer sections of London and various other large cities, and of course were made for the greater part in cellars and badly ventilated places. This often led to disease called necrosis of the bone, caused by the handling of phosphorus, or by inhaling its fumes. This disease in time became so prevalent among the match-makers that, for fear it would be carried along and spread by the manufactured article itself, the local governments took a hand in the matter and forced the owners of these «cellars» to provide well-aired, ventilated and well-lighted places for the employees. With the improvement in surroundings also came improvements in the methods of manufacture. Until about 1842 the splints or sticks of wood used were whittled out by hand entirely, but in that year a machine for cutting these splints was invented by Reuben Partridge, and this practically revolutionized the trade by reducing the number of employees, producing a much better article in a shorter time and materially reducing the cost of manufacture. This will be seen to be true when it is stated that in the year 1856 there were but 40,000,000 matches made in England, while at the present time one factory alone in this country has facilities for making 100,000,000 matches per day.

The general size of the match now made is from 1⅞ to 2½ inches in length, the wood used being pine, thoroughly dried. After having the knots and cross-grained parts cut out of the blocks of pine, those blocks are placed into the automatic feeder of a machine and then run through and cut into splints. These splints are cut by knives or dies so arranged that when cut they are separated about a quarter of an inch and are then set into cast-iron plates made into an endless chain by link attachments. The speed of this machine may be set according to the needs, from 175 to 250 revolutions per minute, and as it cuts 44 matches at each revolution it may easily be seen the rapidity with which matches are now made. After the splints have been cut the endless chain attachment carries them from the cutting end of the machine over a block which heats the heads to a temperature great enough to melt paraffine. After they have passed over the heating block the chain carries them along to the receptacle containing the paraffine and composition forming the head. The reason why the match is heated before reaching these composition rollers is that the paraffine may not be chilled by coming into contact with a cold substance and also the match takes more readily to the composition when heated. Having passed the composition rollers and received its head, the match is cooled off by blasts of cold dry air for an hour and a half and then pushed off the iron plates or endless chain by a mechanical device into small paper or strawboard boxes. These boxes, containing 65 to 500 matches, are automatically fed into the machine and, after having received their quota of matches, are placed on a rotary table, covered and packed into cases. The greater portion of the material used for the composition placed on the head of the match is imported from foreign countries, due probably to the fact that the articles may be more cheaply produced in foreign countries owing to the cheapness of labor.

With the advances made in the methods of manufacturing matches, of necessity the machinery for making the boxes made a corresponding advance, and has practically kept astride of the times. The majority of the inventions made in the strawboard box machinery were made by Mr. E. B. Beecher, of Westville, Conn. While the improvement of the match-making machinery is mainly due to McClintock Young, of Frederick, Md.; J. P. Wright, of New Haven, Conn.; Charles Palmer, John W. Denmead, and Joseph Baughman, of Akron, Ohio. The operation of the machinery for making the paper and strawboard boxes used in the match business is as follows: After having placed a roll of strawboard, cut to the proper width and lined either with pink or white paper, in the machine, the board is scored for the corners; it is then glued by an automatic device, folded into an endless tube and passed on through the printing presses in that form and are printed on three sides. After being cut into proper sizes, the boxes are passed further along by the machine to a compartment where they receive a coat of sand on the fourth side, thus making a striking or rubbing surface for the ignition of the match. Thus the cover is completed and the box proper is made in substantially the same way, with the exception of the printing and sanding, and the entire box is turned out from the machine at the rate of over 400 per minute.

The immense saving accruing from these improved devices has steadily reduced the cost of manufacture, and the rapidity with which the entire operation of match-making is conducted has tended to reduce the number of companies operating factories, and also to greatly reduce the number of people employed in the industry.

The effect of the automatic boxmakers on the number of people employed has been wonderful. To have constructed the 2,000,000 boxes, now made in a single day, 25 years ago, would have taken the combined labor of 1,500 persons, whereas it now takes but 75 people to operate the machines which turn out the same work in a more satisfactory manner. In the number of establishments making matches the effect of the modern machinery has made itself apparent also. Whereas in 1880 there were in the United States 37 companies engaged in the manufacture of matches, employing over 2,200 persons and turning out a product of about 2,200,000 gross per annum, valued at $4,668,446, in 1900 there were only 22 factories, employing 2,047 people, and though the prices had been reduced from 50 to 75 per cent., the product was valued at over $6.000,000.

The statistics of the industry from 1880 to 1905 are as follows:

	1880	1890	1905
Number of establishments	37	27	23
Capital	$2,714,850	$1,941,092	$5,334,035
Salaried officers, clerks, etc	....	59	176
Salaries	....	$70,655	$178,340
Wage earners	2,219	1,696	3,185
Wages	$535,910	$473,556	$1,100,890
Miscellaneous expenses	....	$124,800	$422,704
Cost of materials used	$3,298,562	$935,008	$3,284,855
Value of product	$4,668,446	$2,193,638	$5,646,741

The match-making industry has assumed enormous proportions in Norway, Sweden, Germany, France, and the United States, in France the industry being a government monopoly, in the United States being practically controlled by one corporation.

Mate, an officer in the mercantile marine who acts as the assistant of the captain or master. There are four grades — first, second, third, and fourth mate. The junior mate has usually the superintendence of the stowing of the vessel. The law recognizes only two classes of persons in charge of a trading vessel — the master and the mariners, the mates being included in the latter. In the navy, the term mate is now limited to the assistants of certain warrant officers, as boatswain's mate, gunner's mate, etc.

Matehuala, mä-tä-wä'lä, Mexico, a southern town of the state of Nuevo Léon, with silver-melting establishments and important silver mines in the vicinity.

Materia Medica (Lat. «medical matter»), that division or branch of medical science which treats of drugs, their origin, classification as natural products, preparation, purification, action on the animal economy, together with the mode of administering them for the relief and cure of disease. The action of the various agents in the materia medica upon the human family has been ascertained by experience, sometimes by experiment, especially by administering various drugs to some of the lower order of animals such as dogs, cats, rabbits, guinea pigs, rats and mice. Perhaps the best general classification of medicines, is as stimulants, sedatives, narcotics, emetics, alteratives, tonics, anæsthetics, antispasmodics, astringents, spinants, cathartics, diaphoretics, diuretics, blennorrhetics, emmenagogues, hæmatinics, antacids, irritants, demulcents, coloring agents, and anthelmintics. This classification is based upon the direct effect of the different drugs upon the tissues of the human economy under the various headings which drugs may be conveniently grouped under four general sections, namely: 1. Those which have a special action on the brain, spinal cord and the general nervous system. 2. Those which have a special action on the secretions. 3. Those which change the blood. 4. Those which act locally, when applied to the surface of the body. Section (1) includes antispasmodics, anæsthetics, astringents, narcotics, tonics, sedatives, spinants, and stimulants. Section (2) includes the emetics, emmenagogues, blennorrhetics, diuretics, diaphoretics, and cathartics. Section (3) includes alteratives, antacids, and hæmatinics. Section (4) includes anthelmintics, coloring agents, demulcents, and irritants. See THERAPEUTICS; PHARMACOPŒIA.

Materialism, the philosophical theory that everything which exists is ultimately material in nature, or that whatever is real can be derived and explained in accordance with the laws of material phenomena. This, of course, carries with it a denial of the reality of any finite or infinite spirit as an immaterial substance, and a repudiation of all forms of idealism, which uses thought or intelligence as a principle of explanation. Materialism, however, may be more or less explicit, and may maintain either absolutely, or with various modifications, the primary and all-embracing character of matter. Thorough-going materialism asserts that nothing exists but physical bodies and physical processes. What are called immaterial substances and processes it either declares to be unreal, or explains away as ultimately not different in nature from physical substances and processes. Moreover, for materialism of this consistent and uncompromising type, matter is dead and moved only by mechanical forces. It has no «psychic side,» and the laws which it obeys are the expressions of a blind physical necessity. This extreme view is perhaps no longer maintained by any philosophical thinker of reputation, but in various modified forms it still exists as a tendency to subordinate mental phenomena to physical processes. The more important of these modifications and limitations may be brought under the following heads. (1) The subordination of mental phenomena, while still acknowledging more or less explicitly their distinctive character, to physical, and especially to physiological processes as their determining causes. This position does not avoid any of the practical consequences of materialism, and always tends, when thought out, to revert to the strict ontological form of the theory. For it is clear that if physical processes are able to cause mental modifications, the mind cannot be regarded as fundamentally different in character from the matter which affects it. (2) The view that matter is not a dead lump or mass that moves only when acted upon by some external body, as the older theories assumed, but that every particle of matter — every atom, or it may be every cell — is «conjoined with a soul,» or has a «psychical side,» or «contains a certain element of mind-stuff.» By thus introducing an element which is different in character and in mode of operation from matter, this theory seems to differentiate itself in principle from materialism. Nevertheless, it is usually assumed tacitly by representatives of this modern Hylozoism (q.v.) that within the atom or cell the material side is the primary and determining element, while the psychical is secondary and subordinate. Moreover, the whole mode of conception usually remains at the mechanical stage, since the immaterial element never comes to its rights as an ideal principle, but is conceived as a mere moving force or instinct, and also since it is assumed that the complex mental life can be built up by the composition of psychic elements just as a material body is constituted by the combination of its parts. (3) The position of energism. Recently an attempt has been made to find in energy an ultimate reality in terms of which both mental and material phenomena may be expressed. It cannot be maintained, however, that the conception of energy has yet been clearly defined, nor is everyone prepared to accept the assurance of Prof. Ostwald, the chief representative of the theory, that energy is the concrete reality which we directly experience. To many it may appear to be merely an abstract conception to which no reality can correspond. Apart from this difficulty, however, energism does not avoid materialism merely by dematerializing its fundamental principle. In Prof. Ostwald's hands, it appears to remain essentially materialistic; since the conceptions employed and the laws which the transformations of energy obey are those of physical science.

If the period of the Middle Ages is excepted, when philosophical thought was determined mainly by theological conceptions, materialism may be said to have held a place throughout the whole history of philosophy. We have already noticed some of the forms in which this mode of thought continues to appear at the present day, and may now refer briefly to its more important historical representatives. The systems of the early Greek philosophers who found the fundamental principle of things in some physical substance, such as water, air, or fire, cannot properly be classed as materialism. For as yet there was no opposition between the material and the spiritual. Neither the conception of matter as lifeless and unintelligent substance, nor of mind as an immaterial directing principle, had yet been formed. Atomism (q.v.), as developed by Democritus of Abdera (q.v.), is the first thorough-going system of materialism. Democritus taught that the soul, like everything else, is an aggregate composed of atoms. The soul-atoms differ from all the others in being the finest, smoothest, and most mobile. When they are in isolation, they are insensible, but from their union sensation arises. From sensation all the other processes of the mental life originate. The same conclusions were maintained by the Epicureans (q.v.), who adopted without any essential modification the theory of atomism. In spite of the statement of the Stoics (q.v.) that whatever exists is corporeal, their system cannot properly be described as materialism. For the human soul and God, the all-embracing Logos of which the human reason is a spark or emanation, though constantly described in materialistic terms, yet function ideally as rational directing forces.

Materialism was revived in modern times by Gassendi (1592-1655) (q.v.) under the form of atomism. Modern materialism was, however, first worked out by Thomas Hobbes (q.v.), who based it upon the mechanical conceptions which in his day were being made the basis of all physical science. He did not deny the existence of immaterial things — God, angels, pure spirits — but shrewdly contented himself with showing that only that which is composed of parts, that is, bodies, can be the object of thought and so be known. All real phenomena must therefore be explained in accordance with the mechanical theory and in terms of the movement of bodies. Under the influence of the developing physical sciences, and especially of the dominant conception of mechanism, materialistic tendencies played an important part in the thought of the 18th century. David Hartley (1704–57) and Joseph Priestley (1733–1804) (qq.v.) definitely subordinated the mental life to the bodily processes, though the latter attempts to reconcile his materialism with Christianity and even to support it by appealing to the Bible. It is in France, however, in the systems of La Mettrie (1709–51), Baron d'Holbach (1723–89), and Cabanis (1757–1808) (qq.v.) that we find in this century representatives of materialism who do not hesitate to draw the most extreme consequences of their doctrine, to deny the existence of God, and to reduce man to a mere piece of physical mechanism. Again, in the middle of the 19th century, a revival of materialism occurred in Germany which had an important popular influence. The most important names connected with this movement are Carl Vogt, J. Moleschott, H. Czolbe, and Louis Büchner (whose book, 'Kraft und Stoff'—'Force and Matter'—has been called the Bible of German materialism, and has passed through numerous editions in its English translation). The general adoption of the evolutionary point of view was in the beginning at least favorable to materialism. The philosophical problem seemed to be to derive from some primitive form of matter all the various modes of existence in accordance with the established laws of physical evolution. To this task Herbert Spencer (q.v.) devoted his life with a result that is variously estimated in different quarters. It can at least be said that at present thinkers are more inclined than formerly to question the adequacy of physical science to furnish a complete and final explanation of the nature of the evolutionary process.

Bibliography.— Lange, 'Geschichte des Materialismus' (English translation, 3 vols. London 1878–81); Büchner, 'Force and Matter' (London 1864); Haeckel, 'The Riddles of the Universe' (New York 1899); Paulsen, 'Introduction to Philosophy' (New York 1895).

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Mathematical Induction. See Induction, Mathematical.

Mathematical Societies and Journals. The oldest of the sciences, mathematics has always been cultivated and fostered, often with a degree of preferment over the later branches of the tree of knowledge, by the universities, the great academies, and the other scientific bodies of a general scope throughout the civilized world. That indispensable condition for satisfactory progress, facility of publication, has been provided for mathematicians in a very large degree by the 'Transactions' and 'Proceedings' of learned societies representing a wide scientific field. The specialist will usually prefer the mathematical journals proper, which indeed send out in a steady flow the finest product of the mathematical genius of the age. Theirs is the post of honor; it lies with them, by critical encouragement or repression, to maintain the standard of excellence of a great profession.

But there remains another set of functions, which to-day are more and more efficiently performed by the mathematical societies. These include in their membership nearly every mathematician of standing in the four quarters of the globe. They provide a professional forum for the discussion of mathematical questions and of mathematical interests, and furnish the powerful stimulus of association and solidarity. Their activities cover a wide range, including the presentation and publication of papers and memoirs, the encouragement of bibliographic and encyclopedic undertakings, the organization of international congresses, special conferences and lectures, the exercise of a beneficial advisory influence on the mathematical curricula and equipment of the schools and universities, the diffusion of a better understanding of the science in the educated world, the formation of libraries, collections of models, etc., and the promotion of agreeable social and personal relations among mathematicians.

The following list comprises the principal mathematical societies of the world, arranged in chronological order of foundation, with mention of their several publications:

1690. Mathematische Gesellschaft in Hamburg. Mitteilungen, 1881—.
1778. Wiskundig Genootschap te Amsterdam. Wiskundige Opgaven mit de Oplossingen, 1855—; Nieuw Archief voor Wiskunde, 1875—; Revue Semestrielle des Publications Mathématiques, 1892—.
1866. London Mathematical Society, Proceedings, 1865—.
1866. Moscow Mathematical Society, Transactions, 1869—.
1873. Société Mathématique de France, Bulletin, 1873—.
1883. Mathematical Society of Edinburgh, Proceedings, 1884—.
1884. Circolo Matematico di Palermo, Rendiconti, 1884—.
1886. Mathematical Society of Charkow, Bulletin, 1879.
1888. American Mathematical Society, Bulletin, 1891—; Transactions, 1900—; Mathematical Papers of the Chicago Congress, 1896; Boston Colloquium Lectures on Mathematics, 1905.
1890. Deutsche Mathematiker-Vereinigung, Jahresbericht, 1892—.
1895. British Mathematical Association, Mathematical Gazette, 1894—.

A history of the Hamburg society, prepared in connection with the celebration in 1890 of its two hundredth anniversary, may be found in Vol. II. of the 'Mitteilungen.'

The 'Wiskundig Genootschap' renders an especially valuable service in the mathematical world by the publication of the 'Revue Semestrielle,' a condensed abstract of all the mathematical papers published in the various journals, constantly brought up to within a few months of the current date. The value to a productive mathematician of this great labor-saving device is quite inestimable.

The first president of the London Mathematical Society was the illustrious De Morgan, and the roll of members has included the names of Cayley, Sylvester, H. J. S. Smith, Clifford, Salmon, Stokes, Kelvin, and most of the other eminent British mathematicians of the time. The secretary's office was efficiently filled for the long period of 34 years (1867–1901) by the late Robert Tucker. The 'Proceedings,' which is the leading British mathematical journal, has recently been enlarged in size. The membership of the society is about 300.

The Société Mathématique de France has about the same membership. The meetings are held twice a month at the Sorbonne. The president of the society for 1905 is M. Borel, the secretaries are MM. Grévy and Raffy. The council includes Appell, Darboux, Jordan, Picard, and Poincaré. The 'Bulletin' is issued quarterly.

The Deutsche Mathematiker-Vereinigung represents in full measure the fruitfulness and vigor of German mathematics. Its organization had been foreshadowed for many years, but was actually brought about in 1890 by the initiative of members of the mathematical-astronomical section of the older Society of German Natural Scientists and Physicians, in affiliation with which the Vereinigung still continues to hold its annual meetings. The appearance of the 'Jahresbericht,' whose volumes were originally issued in parts of book form, signalized the beginning of a series of invaluable reports on various branches of mathematics, beginning with the celebrated report by W. F. Meyer on 'The Present Status of the Theory of Invariants' (Vol. I., 1892). These reports and other undertakings of a bibliographical, critical, and statistical character ultimately led to the plan of the great 'Encyclopedia of Mathematics,' now in course of publication by Teubner, under the auspices of the academies of science of Munich, Vienna, and Göttingen. The Vereinigung has also played an active part in the organization of the international congresses of mathematicians, notably those at Zürich (1897) and Heidelberg (1904). It has interested itself effectively in the questions concerning the teaching of mathematics in the schools, universities, and technical institutes, the training of teachers, the correlation of instruction in pure and applied mathematics, and other matters of reorganization and progress in education, some of which are phases of an international reform movement. A history of the Vereinigung by the former secretary and present editor of the 'Jahresbericht,' Prof. A. Gutzmer of Jena, was issued on the occasion of the Heidelberg congress. The society has at present about 650 members. Meetings are held annually. It recently received from B. G. Teubner the gift of a complete set of his extensive mathematical publications as the nucleus of a library. The 'Jahresbericht,' now published monthly with occasional double bimonthly numbers, contains, beside the earlier reports mentioned above and a record of the society's activities, addresses, biographies and necrologies, original papers, criticisms, discussions and reviews, and notes on current events. More extensive papers will hereafter be published as separate volumes.

The American Mathematical Society was originally organized as the New York Mathematical Society in 1888 and was reorganized under its present national title in 1894. Sylvester's work at Baltimore (1877–84) and the influence of young mathematicians returning from study in Germany had produced a tidal movement of which the society has since its early days been the forefront and exemplar. Its membership, now about 500, includes practically every mathematician in the United States, and a considerable number of foreign representatives. The 'Bulletin,' published since 1891 in monthly numbers from October to July, is of the type later adopted by the 'Jahresbericht,' but contains also the official reports of the frequent meetings of the society, with abstracts of the papers presented and a complete bibliography of recent mathematical publications. Another special feature of the 'Bulletin' is the extensive 'Notes' on current events in the mathematical world. A general index of the first 13 volumes was issued in 1904. The 'Transactions,' founded in 1900, is the official organ of the society for the publication of the more important papers read before it. Beside the 'Chicago Congress Papers' and the 'Boston Colloquium Lectures on Mathematics,' the publications of the society include the 'Annual Register,' containing, in addition to the list of officers and members and other official data, the catalogue of the library, now including 2,000 bound volumes, which are deposited in the Columbia University Library.

Regular meetings are held four times a year in New York. Officers are elected at the annual meeting in December. A summer meeting is also held each year at some specially chosen place. At intervals of two or three years the summer meetings are reinforced by colloquia, or courses of lectures by specialists on recent advances in their particular lines of work. The rapid growth of mathematical interest in the Central and Western sections of the country have led to the organization of a Chicago Section (1898) and a San Francisco Section (1902), each of which holds two meetings annually.

The presidents of the society have been J. H. Van Amringe, 1888–90; Emory McClintock, 1890–4; G. W. Hill, 1894–6; Simon Newcomb, 1896–8; R. S. Woodward, 1898–1900; E. H. Moore, 1900–2; Thomas S. Fiske, 1902–4; W. F. Osgood, 1904–06; Henry S. White, 1906–08; Maxime Bocher, 1908–. The secretaries have been Thomas S. Fiske, 1888–95, and F. N. Cole, 1895–. The business of the society is transacted by a council composed of the officers, ex-presidents, and 12 other members elected for a term of three years.

While the society is more especially devoted to the advancement of the higher branches of mathematics, it exerts a considerable influence both directly and through its members on the teaching of the subject in the schools and universities. The report of a committee of the society on college entrance requirements in mathematics has recently been adopted by the College Entrance Examination Board. A report on the requirements for the master's degree, presented to the Chicago Section, has been favorably recognized by several of the Western universities. The society has also contributed materially to bring about the organization of associations of teachers of mathematics throughout the country, a movement especially stimulated by Prof. Moore's presidential address in 1902.

Historical notices of the society may be found in the presidential addresses of Dr. McClintock ('Bulletin,' January 1895) and Prof. Fiske (ibid., February 1905). Other notices are scattered through the secretary's reports. The society, which has doubled in membership in the past 11 years, serves to-day to bring together in a harmonious whole all the mathematical activities of America. It is a centre not only of scientific activity but also of professional good feeling and agreeable personal relations.

The British Mathematical Association, formerly known as the Association for the Improvement of Geometrical Teaching, is devoted to improved instruction in elementary mathematics.

The international congresses of mathematicians have been mentioned above. While these are individually but temporary gatherings, they have come to be an established institution of great and permanent value. Their sequence of time and place is: Paris, 1889; Chicago, 1893; Zürich, 1897; Paris, 1900; Heidelberg, 1904; Rome, 1908.

The exchanges of the American Mathematical Society include about 140 journals which regularly publish mathematical papers of appreciable value. In the notices appended to his collection of abbreviated titles of journals ('Jahresbericht der Deutschen Mathematiker-Vereinigung,' Vol. XII. 1903, pp. 426–444) Felix Müller sets the grand total ever published of all journals of a fairly mathematical complexion at about 1,200, of which over 600 now survive. More than 300 journals are cited in the references of the early numbers of the 'Encyclopedia of Mathematics.' The 'Revue Semestrielle' reports the contents of some 250 journals; the 'Fortschritte' list is about 170.

The oldest journals in Müller's list are the 'Philosophical Transactions' and the 'Journal des Savants,' both dating from the year 1665. Following these are the publications of the academies of Paris (1666) and Bologna (1690). From the 18th century there still survive, beside the journals of the academies (Berlin 1700; Petersburg, 1724; Göttingen, 1751; and others), also the 'Memorie di Matematica e di Fisica' (1782) of the Società Italiana, the 'Bulletin' (1789) of the Société Philomatique of Paris, and the 'Journal de l' Ecole Polytechnique' (1794). Among the extinct journals may be mentioned the 'Ladies' Diary' (1704), 'Gentlemen's Diary' (1741), these two uniting in the 'Lady's and Gentlemen's Diary' (1841–71); the 'Cambridge Mathematical Journal' (1839–45), the forerunner of 'Sylvester's Quarterly Journal'; Gergonne's 'Annales de Mathématique' (1810–31); Tortolini's 'Annali' (1850–7), superseded by the present 'Annali di Mathematica'; and the various journals (1786–1825) of Hindenburg, Breithaupt, Bessel, Kretschmar. In America the ephemeral existences are chronicled of the 'Mathematical Correspondent' (1804–6), 'Adrain's Analyst' (1808) and 'Mathematical Diary' (1825–32), 'Mathematical Companion' (1828–31), 'Mathematical Miscellany' (1836–9), 'Cambridge Miscellany of Mathematics, Physics, and Astronomy' (1842–3), 'Runkle's Mathematical Monthly' (1858–61). The publication of the 'Analyst' (1874–83) marked a substantial advance. Martin's 'Mathematical Visitor' (1877) and 'Mathematical Magazine' (1882) still cling to existence. The 'Mathematical Magazine' (1882) and 'Mathematical Messenger' (1884) are extinct.

The following list gives the date of foundation, the title, and the present place of publication of the strictly mathematical journals now in existence and not already cited in connection with the list of mathematical societies above:

1826.	'Crelle's Journal für die rein und angewandte Mathematik,' Berlin.
1836.	'Liouville's Journal de Mathématiques pures et appliquées,' Paris.
1842.	'Nouvelle's Annales de Mathématiques.'
1855.	'Quarterly Journal of Pure and Applied Mathematics,' London.
1858.	'Annali di Matematica pure ed applicata,' Milan.
1863.	'Giornale di Matematiche di Battaglini,' Naples.
1868.	'Mathematische Annalen,' Leipsic.
1870.	'Bulletin des Sciences Mathématiques,' Paris.
1871.	'Jahrbuch über die Fortschritte der Mathematik,' Berlin.
1872.	'Messenger of Mathematics,' London.
1878.	'American Journal of Mathematics,' Baltimore.
1881.	'Mathesis,' Ghent.
1881.	'Gazeta Matematica,' Bucharest.
1882.	'Acta Mathematica,' Stockholm.
1884.	'Annals of Mathematics,' Cambridge, Mass.
1884.	'Bibliotheca Mathematica,' Leipsic.
1886.	'Periodico di Mathematica' (Supplemento 1898), Leghorn.
1890.	'Nyt Tidssrift for Matematik,' Copenhagen.
1891.	'Revue de Mathématiques speciales,' Paris.
1894.	'American Mathematical Monthly,' Springfield, Mo.
1894.	'L' Intermédiaire des Mathématiciens,' Paris.
1896.	'Il Pitagora,' Palermo.
1896.	'Revue de Mathématiques,' Turin.
1897.	'Wiadomosci Matematyczne,' Warsaw.
1898.	'Formulaire Mathématique,' Turin.
1898.	'L' Education Mathématique,' Paris.
1898.	'Bolletino di Bibliografia e Storia delle Scienze Matematiche,' Turin.
1899.	'L' Enseignment Mathématique,' Paris.
1900.	'Bolletino di Matematica,' Bologna.
1901.	'Rivista trimestral de Matemáticas,' Saragossa.

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Mathematical Society, The American. See AMERICAN MATHEMATICAL SOCIETY, THE.

Mathematics. The science of mathematics — what shall it be said to be? A question much discussed by philosophers and mathematicians in the course of more than 2,000 years, and especially with deepened interest and insight in our own times. Many have been the answers, but none has approved itself as final. All of them, by nature belonging to the "literature of knowledge," fall under its law and tend to "perish by supersession." Naturally enough conception of the science has had to grow with the growth of the science itself. For it must not be inferred that mathematics, because it is so old, is dead. Old it is indeed, classic already in Euclid's day, being surpassed in point of antiquity by but one of the fine arts and by none of the "natural" sciences; but it is not only the oldest science, it is also as new as any, living and flourishing to-day as never before, advancing in a thousand directions by leaps and bounds. It is not merely as a giant tree throwing out and aloft myriad branching arms in the upper regions of clearer light and plunging deeper and deeper root in the darker soil beneath. Rather is it an immense forest of such oaks, which, however, literally grow into each other, so that, by the junction and intercrescence of limb with limb and root with root and trunk with trunk, the manifold wood becomes a single living organic growing whole. A vast complex of interpenetrating theories — such the science now actually is, but it is more wondrous still potentially, component theories continuing more and more to grow and multiply beyond all imagination and beyond the compass of any single genius, however gifted. What is this thing so marvelously vital? What does it undertake? What is its motive? How is it related to other modes and interests of the human spirit?

One of the oldest, at the same time the most familiar, of the definitions conceived mathematics to be the science of magnitude, where magnitude, including multitude as a special kind, signified whatever was «capable of increase and decrease and measurement.» Capability of measurement was the essential thing. That was a most natural definition of the science, for magnitude is a singularly fundamental notion, not only inviting but demanding consideration at every stage and turn of life. The necessity of finding out how many and how much was the mother of counting and measurement, and mathematics, first from necessity and then from joy, so busied itself with these things that they came to seem its whole employment. But now the ordinary notion of measurement as the repeated application of a constant finite unit has been so refined and generalized, on the one hand through the creation of the so-called irrational and imaginary numbers (see ALGEBRA and COMPLEX VARIABLE), and on the other by use of a scale, as in non-Euclidean geometry (see NON-EUCLIDEAN GEOMETRY), where the unit appears to suffer lawful change from step to step of its application, that to retain the old words and call mathematics the science of measurement seems quite inept as no longer telling either what the science has actually become or what its spirit is bent upon.

Moreover, the most striking measurements, as of the volume of a planet, the valency of atoms, the velocity of light, or the distance of star from star, are not done by *direct* repeated application of a unit. They are all accomplished by indirection. Perception of this fact it was which led to the famous definition by the philosopher and mathematician, Auguste Comte, that mathematics is the «science of *indirect* measurement.» Here doubtless we are in presence of a finer insight and a larger view, but the thought is not yet either wide enough or deep enough.

For it is obvious that there is much admittedly mathematical activity that is not in the least concerned with measurement whether direct or indirect. In projective geometry (which see), for example, it was observed that *metric* considerations were either absent or subordinate. The fact, to take a simplest example, that two points determine a line uniquely, or that the intersection of a sphere and a plane is a circle, is not a metric fact: it is not a fact about size or quantity or magnitude. In this field it was *position* rather than size that to some seemed the center of interest, and so it was proposed to call mathematics the science of magnitude or measurement and position.

Even as thus expanded, the definition yet excludes many a mathematical realm of vast, nay, infinite extent. Consider, for example, that immense class of things known as *operations*. These are limitless alike in number and in kind. Now it so happens that there are systems of operations such that any two operations of a given system, if thought as following one another, together thus produce the same effect as some other single operation of the system. For an illustration, think of all possible straight motions in space. The operation of going from a point A to a point B, followed by the operation of going from B to a point C, is equivalent to the single operation of going from A to C. Thus the system of such operations is a closed system: combination of any two operations yields a third not without but within the system. Now the theory of such closed systems—called groups (see GROUPS) of operations—is a mathematical theory of colossal proportions. But it is obvious that an abstract operation, though a very real thing is neither a position nor a magnitude.

This way of trying to come at an adequate conception of mathematics, *viz.*, by attempting to characterize in succession its distinct domains, or varieties of content, or modes of activity, is not likely to prove successful. For it demands an exhaustive enumeration, not only of the fields now occupied by the science, but also of those destined to be conquered by it in the future, and such an achievement would require a prevision that none may claim.

Fortunately there are other paths of approach that seem more promising. Every one has observed that mathematics, whatever it may be, possesses a certain mark, namely, a degree of certainty not found elsewhere. So it is, proverbially, the exact science par excellence. Exact, no doubt, but in what sense? To this an excellent answer is found in a definition of the science given about one generation ago by a distinguished American mathematician, Professor Benjamin Peirce: mathematics is the science which draws necessary conclusions—a formulation of like significance with the fine *mot* by Professor William Benjamin Smith, to wit: mathematics is the universal art apodictic. These statements, though neither of them may be entirely adequate, are, both of them, telling approximations, at once foreshadowing and neatly summarizing for popular use the conclusion reached by the creators of modern logic (see SYMBOLIC LOGIC), that mathematics is included in, and, in a profound sense, may be said to be identical with, symbolic logic. Observe that the emphasis falls on the quality of being «necessary,» or logically *correct*. Naught is said about the conclusions being true. That is another matter, for subsequent consideration.

But why are mathematical conclusions correct? Is it that the mathematician has a reasoning faculty essentially different in kind from that of other men? By no means. What, then, is the secret? Reflect that conclusion implies premises, that premises involve terms, that terms stand for ideas or concepts or notions, and that these latter are the ultimate material with which the spiritual architect, called the reason, designs and builds. Here, then, one may expect to find light. The apodictic quality of mathematical thought, the correctness of its conclusions, are due, not to any special mode of ratiocination, but to the character of the concepts with which it deals. What is that distinctive characteristic? The answer is: precision, sharpness, completeness, of determination. But how comes the mathematician by such completeness? There is no mysterious trick involved: some ideas admit of such precision and completeness of determination, others do not; and the mathematician is one who deals with those that do. Law, says Blackstone, is a rule of action prescribed by the supreme power of a state commanding what is right and prohibiting what is wrong. But what are a state, and supreme power, and right, and wrong? If all such terms admitted of complete determination as do, for example, such terms as triangle and circle, then the science of law would be a branch of pure mathematics. And such, too, to take another example, would be psychology, were consciousness, mind, perception, imagination, and all kindred terms, as completely determinable as the notion sphere. It will be asked, does not the lawyer sometimes arrive at correct conclusions? It may be admitted that he does sometimes, and so, too, of the psychologist or historian or sociologist. When this happens, however, when these students arrive, it is not meant at truth, for that may be by happy chance or by intuition, but when, strictly speaking, they arrive at conclusions that are correct, at conclusions, *i.e.*, that follow logically from completely ascertained data or premises, then that is because they have been for the time acting in all literalness the part of mathematician. That is not to aggrandize the science of mathematics. Rather is it for credit to all serious thinking that, in any considerable garment of thought, one may find here and there, rarely enough sometimes, a mathetic fiber, woven in some perhaps exceptional moment of precise conception and rigorous reason. To think aright is no charactertistic striving of a class of men. It is a common aspiration. Only, as before said, the stuff of thought is mostly intractable, formless, nebulous, like some milky way awaiting analysis into distinct star forms of completely determinate ideas.

The mentioned aspiration and the tendence of all thought, of all science, to assume the character of mathematics admit of many illustrations, which at the same time serve to show clearly the ultimate distinction between that thought which is mathematical and that which is not. One or two such illustrations must suffice.

There is no more common or more important scientific notion than that of function. The term is applied to either of two variable things (including constants conceived as special variables, whose variation is zero in amount) so related that to any value or state of either there corresponds one (or more) value (values) or state (states) of the other. Any two corresponding values or states are said to constitute a pair of values or states, and any two functionally related variables may be called a function-pair. Examples of such function-pairs abound on every hand, as the radius and the area of a circle; the corresponding values of x and y in an equation, $2x-3y+5=0$; elasticity of medium and velocity of sound or other undulation; the amount of sodium chloride formed and the time occupied; the prosperity of a given community and, *ceteris paribus*, the intelligence of its patriotism. Indeed it may be that there is no thing which is not in some sense a function of every other. Be this as it may, one thing is very certain, namely, a very great part, if not the whole, of our thinking is primarily concerned with functional relationships, deals, that is, immediately or mediately with pairs or systems of corresponding values or states or changes. Behold, for example, how the parallelistic psychology searches for correlations between psychical and physical phenomena. Witness, too, the sociologist seeking to determine a law of correspondence between the homogeneity of a population and its peacefulness; the anthropologist attempting to find a formula correlating mental power and brain-weight; the physicist's determinations of dependence between pressure and volume of a gas; and so on and so on. It is, then, here, in the immense and wondrously diversified domain of correspondence, the answering of value to value, of change to change, of condition to condition, of state to state, that the knowing activity, the intellect, finds its field.

What is it precisely that we seek to do by means of a correlation? The answer is: when one or more facts are given or known, to pass with absolute certainty to the correlative fact or facts. For example, if $y=\sin x$, then, if a value be assigned to x or y, the corresponding value or values of y or x are determined by the equation, or definition, of the functional correspondence between the assemblage of values which x may take and the assemblage that y may assume. To effect the desired transition from the given or known to the dependent ungiven or unknown, obviously requires one or more formulæ or equations which shall serve to define precisely the manner of correspondence, the law of dependence. Where do such defining formulæ or equations come from? Strictly speaking, they are never *found*, they are always *assumed*, assumed immediately or else mediately, that is, in the latter case, derived by assumed logical processes from such as belong to the former case. This statement is valid in every field of logical thought. In every field it is true that from nothing assumed nothing can be derived. Now, nothing is easier than to write down a perfectly definite formula that does not tell how cheerfulness depends on climate or retentiveness on interest or the volume of a cube on its dimensions. The mentioned inapplicability or "inutility" does not, however, at all tend to invalidate the formula regarded as defining a certain law of correlation. Indeed a given formula may be perfectly intelligible in itself; it, alone or joined with others in similar case, may state a perfectly intelligible law of correspondence, which, nevertheless, may have no validity whatever in the physical or in the sensuous universe. What is it, then, that guides in the choice of formulæ? For such determination or choice seems hardly referable to chance alone. The answer is that, broadly speaking, choice is determined by curiosity, and curiosity is itself not determined by choice, but is rather matter of native gift or predilection.

Just here we are in position where we have only to look steadily a little in order to perceive clearly the sharp and ultimate distinction between mathematics, on the one hand, and physical or other science, on the other. These are discriminated according to the kind of curiosity whence they spring. The mathematician is curious about definite abstract relationships, about logically possible modes of order, about varieties of abstract implications, about completely determined or determinable functional relationships considered solely in and of themselves, that is, without the slightest concern about the question whether or no they have external or sensuous or other sort of validity than that of being logically thinkable. It is the aggregate of logically thinkable relationships that constitutes the mathematician's universe, an indefinitely infinite universe, worlds in worlds of worlds in worlds of wonders, inconceivably richer in mathetic content than can be any outer world of sense. Immense indeed and marvelous is our own world of sense with its rolling seas and stellar fields and undulating ether. But compared, one need not say with the entire world of mathesis, but only with the hyperspaces (see HYPERSPACE) explored by the geometrician, the whole vast region of the sensuous universe is literally as a merest point of light in a shining sky.

Now this mere speck of a physical universe, in which the chemist, the physicist, the astronomer, the biologist, the sociologist, and the rest of nature students, find their great fields, may be, as it somewhat seems to be, a realm of invariant uniformities or laws; it may be a mechanically organic aggregate, connected into an ordered whole by a tissue of completely definable functional relationships; and it may not. In other words, it may be that the universe eternally has been and is a genuine cosmos, that the external sea of things immersing us, although it is ever changing infinitely, changes only lawfully, in accordance with a system of immutable laws, constituting an *invariant* (see INVARIANTS AND COVARIANTS) at once underived and indestructible and securing everlasting harmony through and through; and it may not be such. The student of nature assumes, he rightly assumes, that it is, and, moved and sustained by appropriate curiosity, he endeavors to find in the outer world what are the elements and relationships assumed to be valid there. «Natural science,» said Bernhard Riemann, «is the attempt to comprehend nature by means of exact concepts.» The mathematician, as such, does not make that assumption and does not seek for relationships in the outer world.

Is the assumption correct? Undoubtedly it is admissible, and as a working hypothesis it is undoubtedly very useful or even indispensable to the student of external nature; but is it true? The mathematician, as man, does not know although he greatly cares. Man, as mathematician, neither knows nor cares. The mathematician does know, however, that, if the assumption be correct, every relationship that is valid in nature is, *in abstractu*, an element in his domain, a subject for his study. He knows, too, at least he strongly suspects, that, if the assumption be not correct, his domain remains the same absolutely. The two realms, of mathematics, of natural science, like the two attitudes, the mathematician's and that of the nature student, are fundamentally distinct and disparate. To think logically the logically thinkable—that is the mathematician's aim. To assume that nature is thus thinkable, an embodied rational logos, and to discover the thought supposed incarnate there—these are at once the principle and the hope of the student of nature.

Suppose the latter student is right, suppose the outer universe really is an embodied logos of reason, an infinitely intricate garment ever weaving and ever woven, warp and weft, of logically determinate relationships, does that imply that all of the logically thinkable is incorporated in it? It seems not. A cosmos, a harmoniously ordered universe, one that through and through is self-compatible, can hardly be the whole of reason materialized and objectified. There appears to be many a rational logos. At any rate the mathematician has delight in the construction and contemplation of divers systems that are inconsistent with one another, though each is composed of consistent relationships. He constructs in thought, as witness the geometry of hyperspaces, ordered worlds, worlds that are possible and logically actual, and he is content not to know if any of them be otherwise actual or actualized. There is, for example, a Euclidean geometry and there are infinitely many kinds of non-Euclidean (see NON-EUCLIDEAN GEOMETRY). These theories regarded as «applied» mathematics, regarded, that is, as *true* descriptions of some one actual space, are incompatible. In our universe, to be specific, if it be, as Plato thought and nature science takes for granted, a geometrized or geometrizable affair, then one of these geometries may be, none of them may be, not all of them can be, objectively valid in it. But in the vaster world of thought, in the world of pure mathesis, all of them are valid; there they coexist, and interlace among themselves and others as differing strains of a hypercosmic harmony.

A geometry, indeed any mathematical theory, consists of a definite system of determinate compatible principles or assumptions or hypotheses or postulates (commonly called axioms) together with their implications, their logically deducible consequences. Accordingly, natural science, the term being broadly employed to signify knowledge that is ultimately dependent upon «observation and experiment,» cannot be or become strictly mathematical. It aspires to the *character*, and approximates and imitates the *form*, of mathematics, but it can never really attain either. Mathematics is concerned with implications, not applications. Such terms as «applied mathematics,» «mathematical physics,» and the like, are indeed in common use, but the signification, rightly understood, is always that of a mixed doctrine, a doctrine that is thoroughly analyzable into two disparate parts: one of these consists of determinate concepts formally combined in accordance with the established canons of ratiocination, *i.e.*, it is pure mathematics and not natural science; the other is matter of observation and experiment, *i.e.*, it is natural science and not mathematics. No fiber of either component is a filament of the other. Whether the behavior of natural phenomena is or is not exactly descriptible by mathematical formulæ can never be ascertained, for the means to «natural knowledge,» *viz.*, observation and experiment, are fallible by nature, and, however refined or prolonged, are incapable of yielding absolute exactness or certainty. Of any so-called law of nature, «the most, the last, the best that can be said» is that its agreement with the facts is so nearly perfect that every discrepance, if any there be, has escaped detection.

Cannot the like be said of mathematics? In the foregoing conception of mathematics it has indeed been tactily assumed that some ideas are completely determinable, that there are possible systems of postulates absolutely free alike from obscurity and from interior contradiction, that the postulates of such a system import a perfectly definite body of ascertainable implications, and that there is a perfect standard of logic quite independent of time and place and of the defects and idiosyncrasies of individual reasoners. May not these assumptions, some or all of them, be incorrect? There are some grounds, historical and biological, for suspecting that such may be the case. Such an admission, however, whether tentative or unconditioned, has by no means the effect of undefining mathematics or of dethroning the science from its commanding position among the knowledges. It would indeed leave man without the possession, even without the hope, of *absolute* knowledge, but, among all the forms of actual or potential proximate knowledge, mathematics would still rightly rank as highest. It would indeed be marked by a degree of uncertainty or indeterminateness or relativity or inexactness, *viz.*, that degree of inexactness which by supposition would belong to *all* meanings and standards. Hence it would not be peculiar to mathematics, but would be common to it and every other science. But every such 'other science' has an *additional* mark of indeterminateness, the characteristic inexactness of all possible observation and experiment. In any case, then, the observational and experimental sciences are, in respect to certainty and exactness, hopelessly inferior to mathematics.

But in all ages it has been the faith of the mathematician that complete determination of concepts and absolute rigor of demonstration are in fact attainable, not, however, in the realm of observation and experiment, but in the world of pure thought. It is, then, in that world, where all *entia* dwell, where is every type of order and every manner of correlation and every variety of relationship and every form of implication, it is in this infinite ensemble of eternal verities whence, if there be one cosmos or many of them, each derives its character and mode of being,—it is there that the spirit of mathesis has its home and its life.

Is it a restricted home, a narrow life, static and cold and gray with logic, without artistic interest, devoid of emotion and mood and sentiment?

That world, it is true, is not a world of solar light, it is not clad in the colors that glorify the things of sense, but it is an illuminated world, and over it all and everywhere throughout are hues and tints transcending sense, painted there by radiant pencils of psychic light, the radiance in which it lies.

It is a silent world. Nevertheless, in respect to the highest principle of art—the interpenetration of content and form, the perfect fusion of mode and meaning—it even rivals music.

In a sense, it is a static world, like those of the sculptor and the architect. The figures, however, which reason constructs and the mathetic vision beholds, transcend the temple and the statue, alike in simplicity and in intricacy, in delicacy and in grace, in symmetry and in poise.

Not only are this home and this life, thus rich in æsthetic interests, really controlled and sustained by motives of a sublimed and supersensuous art, but the religious aspiration, too, finds there, especially in the beautiful doctrine of invariants, the most perfect symbols of what it seeks—the changeless in the midst of change abiding things in a world of flux, configurations that remain the same despite the swirl and stress of countless hosts of curious transformations.

Literature.—The literature having for its object the exposition of the nature and principles of mathematics is extensive. By far the most important recent contribution, which at the same time serves to introduce the reader to the chief memoirs in the field, is B. Russell's 'The Principles of Mathematics,' vol. I. For an excellent critical review of the principal modern attempts to define mathematics, the reader may be referred to Professor M. Bôcher's 'The Fundamental Conceptions and Methods of Mathematics' ('Bull. of the American Math. Soc.,' vol. XI.).

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Mather, Măt'h'ĕr, **Cotton,** American colonial clergyman, son of Increase Mather (q.v.): b. Boston 12 Feb. 1663; d. there 13 Feb. 1728. He entered Harvard College at 11, and at his graduation in 1678 President Oakes expressed his expectation that he would resemble his venerable grandfathers John Cotton and Richard Mather, who should be united and flourish again in him. He was early distinguished for piety, and in his 14th year began a system of rigid and regular fasting and vigils which he continued through life. He was occupied after leaving college with teaching, in 1680 became the assistant of his father in the pastorate of the North Church, Boston, and in 1684 was ordained as his colleague. When, at the report of the landing of the Prince of Orange in England, Governor Andros was seized and imprisoned in Boston, Cotton Mather prepared the public declaration justifying the measure. But it is in connection with proceedings concerning witchcraft that he is most generally known. In 1685 he published his 'Memorable Providences relating to Witchcraft and Possessions,' narrating cases which had occurred at intervals in different parts of the country; and during the witchcraft excitement in Salem in 1692 was a prejudiced investigator in the matter, publishing the next year his 'Wonders of the Invisible World,' in order to confirm believers in that kind of demoniac possession. In 1702 appeared his greatest work, 'Magnalia Christi Americana,' an ecclesiastical history of New England concerning which he was admitted to know more particulars than any other man. Though strongly marked by his partialities and prejudices, its somewhat quaint and grotesque character, its admixture of superstition, learning, and ingenuity, make it still interesting. In 1713 his 'Curiosa Americana' was read before the Royal Society of London, and he was elected a member of that body, being the first American to receive this distinction. In its 'Transactions' in 1721 appeared an account of the practice of inoculation for the smallpox, recently introduced by Lady Mary Wortley Montagu; and it was by the efforts of Mather in connection with Dr.

Boylston, against both professional and popular prejudice, that the operation was first performed in Boston. His 'Essays to Do Good' (1710) was admitted by Dr. Franklin to have influenced some of the principal events of his life; and his 'Christian Philosopher' and 'Directions for a Candidate of the Ministry' enjoyed high repute. His 'Parentator' (1724) is a life of his father, Increase. Vain and pedantic as he was and narrow and credulous as he showed himself to be in regard to witchcraft and other topics of his time, he was in many directions a useful, public-spirited citizen who deserves to be regarded more leniently by posterity than has sometimes been the case. Consult: 'Life' by Samuel Mather (1729); Pond, 'The Mather Family' (1844); Marvin, 'Life and Times of Cotton Mather' (1892); Wendell, 'Cotton Mather' (1891); Tyler, 'History of American Literature' (1881).

Mather, Increase, American colonial divine son of Richard Mather (q.v.): b. Dorchester, Mass., 21 June 1639; b. Boston 23 Aug. 1723. He was graduated at Harvard College in 1656, and in 1658 at Trinity College, Dublin. He afterward preached in Devonshire and the island of Guernsey, and on the Restoration was urged to conform and settle in England; but he refused, and on his return to Boston was invited to preach to the North Church, of which he was ordained pastor in 1664. This office he held for 62 years. He was a member of the synod of 1679, and drew up the propositions which were adopted concerning the proper subjects of baptism. In 1681 he was elected president of Harvard College, but the reluctance of his church to relinquish him induced him to decline the position. In 1684 the office was again offered him, and he accepted it with a stipulation that he should retain his relation to his people. He continued in this station till 1701, when he retired in consequence of an act of the general court requiring the president to reside in Cambridge. He received the first diploma for the degree of D.D. that was granted in America. When in 1683 Charles II. demanded that the charter of Massachusetts should be resigned into his hands, Mather was foremost in opposing the measure; and when that monarch annulled the charter in 1685, he was sent to England as agent for the colonies. He was in England during the revolution of 1688, and, having found it impossible to obtain a restoration of the old charter, accepted a new one, under which the appointment to all the offices reserved to the crown was confided to him. He returned in 1692, when the general court appointed a day of thanksgiving for his safety and for the settlement of the dispute. He is stated to have condemned the violent proceedings which followed relating to witchcraft. He was accustomed to spend 16 hours every day in his study, and always committed his sermons to memory. One tenth part of all his income was devoted to purposes of charity. He was the author of 92 distinct publications. His 'Remarkable Providences' was republished in the 'Library of Old Authors' (1856), and other works by him are: 'Cometographia, or a Discourse Concerning Comets' (1683); 'Cases of Conscience Concerning Witchcraft' (1693). Consult: Pond, 'The Mather Family' (1844); Walker, 'Ten New England Leaders' (1901).

Mather, James Marshall, English nonconformist clergyman and author: b. Darlington 1851. He studied architecture in Lincoln and later prepared for and entered the nonconformist ministry. He has published: 'Life and Teachings of John Ruskin,' which has passed through nine editions; 'Popular Studies in 19th Century Poets'; 'Lancashire Idylls'; 'The Sign of the Wooden Shoon'; 'By Roaring Loom'; etc.

Mather, Richard, American colonial divine: b. Lowton, Lancashire, England, 1596; d. Dorchester, Mass., 22 April 1669. He became a schoolmaster at Toxteth Park, near Liverpool, at the age of 15; studied at Brazenose College, Oxford, in 1618; was ordained in the English Church soon after, and became the minister of Toxteth, in which position he remained 15 years. He was suspended for non-conformity to the ceremonies of the Established Church in 1633, and though soon restored by the influence of friends was again silenced in the following year. He therefore decided to emigrate to New England, arriving in Boston in August 1635. The next year he became pastor of the church in Dorchester, and held that position till his death. He was one of the compilers of the 'Bay Psalm Book,' and assisted to frame in 1648 a model of discipline known as the Cambridge Platform. He married for his second wife the widow of John Cotton (q.v.). His 'Journal, Life and Death' was issued by the Dorchester Historical Society in 1850. Consult: Increase Mather, 'Life and Death of Richard Mather' (1670); Tyler, 'History of American Literature,' Vol. II. (1881).

Mather, William Williams, American geologist: b. Brooklyn, Conn., 24 May 1804; d. Columbus, Ohio, 26 Feb. 1859. He was graduated from West Point in 1828 and was an assistant professor of chemistry and geology there, 1829–35. After a short period spent as professor of chemistry at the University of Louisiana (1836), he undertook the superintendence of a geological survey of the 1st district of New York State which included the Hudson River counties, a labor which lasted from 1836 to 1844. He was also state geologist of Ohio 1837–40, and of Kentucky 1838–9, and from 1842–5, and 1847–50, professor of natural science in the Ohio University at Athens. He contributed frequently to scientific journals, edited the 'Western Agriculturist' for a time and published 'Geology of the 1st Geological District' in 'Natural History of New York' (1843).

Mathers, math'ėrz, **Helen.** See Reeves, Helen Mathers.

Matheson, măth'ĕ-sŏn, **George,** Scottish Presbyterian clergyman: b. Glasgow 27 March 1842. He was educated at Glasgow University and although he had lost his sight he entered the ministry of the Kirk of Scotland and was ordained in 1868. He was in charge of St. Bernard's Church, Edinburgh, 1886–95. Among his many published books are: 'Aids to the Study of German Theology' (1874); 'Natural Elements of Revealed Theology' (1881); 'The Psalmist and the Scientist' (1887); 'Sidelights from Patmos' (1897); 'The Sceptre Without a Sword' (1901); 'The Representative Men of the Bible' (1902).

Mathew, măth'ū, **Frank**, English novelist: b. Bombay 1865. He was educated at London University and became a solicitor in 1889. He has published: 'Father Mathew: his Life and Times' (1890); 'At the Rising of the Moon: Irish Stories and Studies' (1893); 'The Wood of the Brambles' (1896); 'The Spanish Wine' (1898); 'The Royal Sisters' (1901).

Mathew, Theobald, known as "Father Mathew," Irish temperance reformer: b. Thomastown Castle, County Tipperary, Ireland, 10 Oct. 1790; d. Queenstown, Ireland, 8 Dec. 1856. He was educated at Maynooth College and ordained to the Roman Catholic priesthood in 1814. In 1838 he inaugurated a temperance crusade and his labors in Great Britain and Ireland induced hundreds of thousands to sign the total abstinence pledge. The most conclusive evidence of the benefit of his preaching was the reduction of nearly £600,000 on the duties of spirits imported in Ireland in five years. He made a tour of the United States in 1849–51 and was very successful. Though pensioned by the queen he was never entirely relieved from the burden of debt with which his extended tours had burdened him, and which caused his imprisonment for a time in 1847. Consult, 'Life' by Maquire (1863); F. Mathew, 'Father Mathew: his Life and Times' (1890).

Mathews, măth'ūz, **Albert**, "Paul Siegvolk," American lawyer and author: b. New York 8 Sept. 1820; d. there October 1903. He was graduated from Yale in 1842 and after studying law was admitted to the New York bar in 1845. He soon acquired an extensive practice and was especially skilled in chancery practice. He found time for literary work despite the claims of his profession, and under the pseudonym, "Paul Siegvolk," published: 'Walter Ashwood,' a once popular love story (1860); 'A Bundle of Papers' (1879); 'Thoughts on Codification of the Common Law' (1881); 'Ruminations: The Ideal American Lady and Other Essays' (1892); 'A Few Verses' (1893); etc. In the early part of his career he was a close friend of N. P. Willis (q.v.), whom he aided in establishing 'The Home Journal.'

Mathews, Charles, English actor: b. London 28 June 1776; d. Plymouth, England, 28 June 1835. He made his début as an actor in Richmond in 1793 and was subsequently engaged for some years in Dublin and London. In 1818 he made a hit as a professional entertainer in his 'At Home.' He continued in this class of work, making two successful trips to the United States and returning, presented in England with great success 'A Trip to America.'

Mathews, Charles James, English actor: b. Liverpool 26 Dec. 1803; d. Manchester, England, 24 June 1878. He was the son of Charles Mathews (q.v.) and was educated as an architect, but abandoned that calling for the stage. As a light comedian he was very successful, but his attempts at managing Covent Garden and the Lyceum Theatre in London were failures. He made several trips to the United States, Paris and Australia, presenting an entertainment similar to his father's famous 'At Home.'

Mathews, Ferdinand Schuyler, American artist and author: b. New Brighton, N. Y., 30 May 1854. He was educated at Cooper Institute, studied art in Italy and has made a specialty of decorative designing. He has contributed extensively to the magazines both as illustrator and writer, in the latter field dealing chiefly with subjects which come within his own profession. He has published: 'The Writing Table of the 20th Century' (1900); 'The Field-Book of American Wild Flowers' (1902); etc.

Mathews, Shailer, American educator: b. Portland, Maine, 26 May 1863. He was graduated from Newton Theological Institution in 1887 and studied in Berlin. In 1887 he was appointed assistant professor of rhetoric at Colby University, and in 1889 accepted the chair of history and political economy, which he occupied until 1894, when he was made junior dean of the Divinity school in the University of Chicago and professor of New Testament history. He has published: 'Select Mediæval Documents' (1891–1900); 'The Social Teaching of Jesus' (1897); 'A History of New Testament Times in Palestine' (1899); 'The French Revolution: a Sketch' (1901); 'Principles and Ideals for the Sunday School' (1903); etc.

Mathews, William, American author: b. Waterville, Maine, 28 July 1818; d. Boston, Mass., 14 Feb. 1909. He studied law at Harvard and was admitted to the bar in 1838, practising for a time in Waterville, but abandoned law for journalism. In 1862 he was appointed professor of English and rhetoric at the University of Chicago, but in 1875 resigned in order to devote himself exclusively to literature. Among his books are: 'Getting on in the World' (1873); 'The Great Conversers' (1874); 'Oratory and Orators' (1870); 'Men, Places and Things' (1888); 'Nugæ Literariæ' (1896); etc.

Mathews, William Smythe Babcock, American musical writer and editor: b. Loudon, N. H., 8 May 1837. He obtained his musical education in Boston and became a teacher in 1853; he was for a time engaged at the Wesleyan Female Seminary in Georgia, but in 1867 he removed to Chicago, where he has been prominent as an organist and engaged in editorial work and criticism of music on the leading Chicago papers. In 1891 he established the magazine 'Music,' and edited it until 1903, when it became a part of the 'Philharmonic.' He is the author of: 'How to Understand Music' (1880–8); 'Music and Its Ideals' (1897); 'Dictionary of Musical Terms' (1895); 'Popular History of Music' (1901); 'The Great in Music' (1900–03); etc.

Mat'in, a large hound-like French dog, resembling the great Dane, but having a rough coat. The head is elongated, the forehead flat, the ears pendulous toward the tips; color, yellowish-fawn or whitish. It is commonly employed in France as a sheep-dog and watchdog.

Mat'ins, the daily office of Morning Prayer in the Anglican communion. It is composed in part of the pre-Reformation offices of Matins and Lauds. In the Roman Catholic Church, the first portion of the Divine Office, with which Lauds are usually associated. On Sundays and double feasts matins have three nocturns; on simple feasts and week-days, one nocturn. Easter and Pentecost have each only one nocturn, with three psalms. After private prayer versicles and responses are recited; the invitatory psalm follows. In the first nocturn are said three psalms on feast days, 12 when the office is of the Sunday, and three lessons from Scripture; the second and third nocturns have each three psalms, and the lessons are chosen from the patristic writings for the second, and from some commentary on the Gospel of the day of the third nocturn.

Matriar'chate, position or power of a matriarch, a name formerly given to the wife of a patriarch. Among the Indians the mother is considered of superior importance in families, clans, or tribes. Job's wife, Xantippe, and others in history have been called matriarchs. In certain primitive tribes the mother, in line of descent and inheritance, takes precedence of the father.

Mat'rimony Vine. See LYCIUM.

Matronalia, the first of March, the New Year's day of the Roman religious calendar, sacred to Juno, the deity of matrons. On this festival day wives expected presents from their husbands, and themselves gave an entertainment to the household slaves.

Matsukata, Masayoshi, mä-sī-ō'shē mät-soo-kä'tä, COUNT, Japanese statesman: b. Satsuma 1835. He was son of a samurai, but fell in with the Radical party; was made head of the prefecture (or *ken*) of Hida after the revolution; was prominent in the tax reform of 1875; represented Japan in several industrial exhibitions; was a member of the Cabinet, in 1880 as minister of commerce, in 1881 as minister of finance, and, with the same portfolio, as prime minister from 1891 to 1893. His great work was in 1896–7, when he formed a new cabinet, carried through the gold standard, set Japanese credit on its feet, but he was forced to retire because of the ill-success of his scheme of taxation.

Matsys, mät-sīs', or **Massys, Quentin,** Flemish painter: b. Antwerp about 1460; d. there between 13 July and 16 Sept. 1530. A blacksmith until he was 20, legend says that he turned artist to win the love of a painter's daughter. He was acquainted with many of the notables of the day, including Dürer, Erasmus, and Sir Thomas More. Much of his present fame is due to genre pictures, especially of misers and money-changers, which are not his work, but that of his school, among them his son Jan, whose ‹Misers› is at Windsor Castle. Matsys' own work is styled a connecting link between Van Eyck and the later Dutch realists; apart from such excellent portraits as those of Maximilian of Austria and Petrus Aegidius, it is mostly religious in theme. The ‹Burial of Christ,› an altarpiece for the Antwerp Cathedral, now in the Antwerp Museum, and the ‹Story of St. Anne,› now in the Brussels Gallery, are the best examples of his work.

Mat'tawa, a river in Canada, the source of which is Trout Lake, east of Lake Nipissing. It flows east a distance of about 50 miles and enters the Ottawa River at Mattawa. This river forms part of an almost continuous waterway from the Ottawa River to Lake Huron, and before the Canadian Pacific railroad was built this water route was much used for transportation and travel.

Matteawan, măt-tẹ-ạ-wŏn', N. Y., village, in Dutchess County; on Fishkill Creek, and on the New York, N. H. & H., and the Newburg, D. & C. R.R.'s; about 45 miles north of New York and two miles east of the Hudson River. The first permanent settlement was made in 1804; but there had been trading posts in the vicinity in the 18th century. Matteawan is in an agricultural region, and has considerable trade in fruit, potatoes, and dairy products. The industrial establishments are hat factories, novelty works, machine-shops, silk mills, coal and lumber yards. The prominent buildings are the State Hospital for the Criminal Insane, New Hospital, Highland Hospital, and the Howland Circulating Library. Pop. (1910) 6,727.

Mattei, măt-tā'ē, **Tito,** Italian musician and composer: b. Campobasso, Italy, 24 May 1841. He was educated in Naples. He was accorded the degree of professor in Saint Cecilia's Academy at Rome when he was 11 and was also elected a member of the Philharmonic Society in Florence and other cities. He gave his first concert when 15 and afterward made tours of Europe, but in 1863 settled in London and confined his concert tours to Great Britain, and in 1870 he conducted an Italian opera at the Lyceum theatre. He is the composer of hundreds of songs and pianoforte pieces, many of which have become widely popular, and the operas: ‹Maria di Gand›; ‹La Prima Donna›; etc.

Matter, in physics, mechanics and chemistry, the tangible substance of which the world external to our minds is composed, and which is characterized by the resistance which it opposes to muscular efforts exerted upon it. Since we can know it only through the mediation of our senses, its actual objective reality has often been questioned by philosophers and methaphysicians; and in order to avoid doubtful points of this sort it is frequently defined merely as a «physical concept,» without making any hypothesis as to its objective existence. (Consult Pearson, ‹The Grammar of Science.›) In physics and chemistry we think and speak of it as having a real existence, however, just as we do in common life. For scientific purposes it is highly important to be able to accurately compare the quantities of matter in two bodies; but the phrase «quantity of matter» is not commonly used in science, the word «mass» (or inertia) being substituted for it. The term «mass» is synonymous with «quantity of matter» so long as the bodies compared are identical in composition and in physical state; but by its use we avoid the uncertainty in the meaning of the longer phrase, when it is applied to bodies of dissimilar composition. Two bodies are said to have «equal masses» under the following conditions: Let the two bodies be conceived to be initially at rest, and free from the action of any external forces whatsoever. Let them then be exposed to the action of equal forces for an equal length of time. If, under these circumstances, the velocities that are produced in the two bodies are equal, the masses of the bodies are also equal, *by definition*. But if the velocities that are produced are unequal, then the masses are also unequal, and are (by definition) proportional to these velocities; the body which is moving the faster being the one whose mass is the less. It would be impossible to carry out an elaborate experiment of this kind every time we wished to compare the masses of a pair of bodies, and it fortunately happens that masses can be compared with great accuracy by merely weighing the bodies against each other in a balance. For equality of weight means that the earth's attractive force is the same upon both; and if (as we

know to be the case, by experiment,) the two bodies would fall with the same speed in a vacuum, it follows that equal forces acting upon the two bodies for equal times communicate to them equal velocities; and hence, by the definition of "mass," the masses of the two bodies are equal. It will be noted that mass and weight are two esentially different things, although they are very commonly confused, because they are strictly proportional to each other, according to the most accurate experiments that have yet been made. Yet it is not at all impossible to imagine a state of things in which mass and weight would not be strictly proportional. It is only by experiment, for example, that we know that the earth attracts a body with precisely the same force, whether the body is hot or cold. The attraction between two permanent magnets varies with the temperature, and it may yet be found that gravitative attraction varies in the same way, though to a much smaller extent. Numerous experimenters have in fact fancied that they could detect an effect of this kind, though its reality is not yet admitted. But we can hardly admit that the mass of a body is a function of the temperature; and so we see that the apparently strict proportionality between mass and weight is not at all a necessity of thought, but merely an experimental fact, which may any day be shown to be nothing but a close approximation to the actual truth.

So far as we know, matter can neither be destroyed nor created by any experimental means at our command, nor by any process now operative in nature. This great fact is often called the "law of the conservation of matter," and it appears to be rigorously true. As has been pointed out above, future experiment may show that the weight of a body depends to a slight extent upon its temperature, and it may also be found that the weight of a chemical compound is not always precisely equal to the sum of the weights of its constituents; but it is believed that any irregularities of this sort that may be discovered will hold true of the weight only, and will not affect the mass; and that the weight will also return to its original value when the substance that is weighed is brought back to the same chemical and physical condition again. The gravitative action of matter is one of its most singular attributes, and one which we are still far from understanding. It is apparently true that every particle of matter attracts every other particle with a force which is directly propotional to the product of the masses of the two particles, and inversely proportional to the square of the distance between them, and independent of every other circumstance. It is not certain that this law holds true, nor that the attraction exists at all, at distances comparable with the distance from the earth to the fixed stars, but it appears to hold rigorously at distances commensurate with the dimensions of the solar system. Electric and magnetic forces may be either attractive or repulsive; but gravitative action is probably always attractive, the only phenomena which would countenance the opposite view being the apparent repulsion that the sun exerts upon the tails of comets, and upon the coronal streamers that are seen at the time of a total solar eclipse.

Matter exists in three (or perhaps four) physical states. All ordinary bodies, for example, may be classified, roughly, either as solids or fluids; fluids being further subdivided into liquids and gases. This classification is not all that could be desired, since there are certain bodies (such as wax) which have certain characteristics of the solids, and certain others of the liquids. A more complete and systematic classification is hardly practicable, however, in the present article. A solid body may be defined as a body capable of resisting a considerable shearing stress. (See ELASTICITY.) Solid bodies usually have a considerable tensile strength also. A solid does not yield continuously to a small deforming force; it resists deformation, and its resistance increases as the deformation increases. A fluid, on the other hand, is a substance having almost no shearing strength, and offering very little resistance to forces that tend to change its shape. A fluid yields continuously to a deforming force, and a force that will deform it at all will deform it indefinitely, so long as it is allowed to act. Considering the subdivision of fluids into gases and liquids, we may say that a gas is a fluid that presses continuously and in every direction upon the walls of the vessel containing it, and which follows them indefinitely if they retreat. A gas, if left to itself, tends to expand infinitely in all directions. A liquid is a fluid which does not follow the walls of the containing vessel if they retreat, and which has no tendency to expand indefinitely if left to itself. (For the prevalent theories regarding the constitution of matter, see GASES, KINETIC THEORY OF; MOLECULAR THEORY.)

When a gas is rarefied very highly by a mercury vacuum pump, it exhibits properties which are different in many respects from those manifested by gases in the ordinary state of density. The pressure in such a rarefied gas, for example, may be different in different directions; so that in this respect, at least, the rarefied medium resembles a solid rather than a gas or liquid. Mechanical and electrical properties are also observed at high exhaustions which cannot be reproduced at ordinary pressures; and for these and other reasons Crookes considered that a gas, when under only (say) the millionth or ten millionth of an atmosphere of pressure, may be fairly said to constitute a "fourth state of matter," which he considered to be as different from the gaseous state as the gaseous state is from the liquid state. At first thought this appears to be an extreme and hardly a justifiable view; but it must be remembered that Andrews showed that the distinction between a liquid and the gas or vapor obtained from it by evaporation ceases to exist at temperatures higher than a certain critical value peculiar to each substance. (See CRITICAL POINT.) This temperature is about 88° F. for carbon dioxid, and at temperatures progressively higher than this the isothermals of carbon dioxid approximate with increasing closeness to the hyperbolas of a perfect gas. It might be thought that a critical state exists with reference to the solid and liquid states; but this is still somewhat doubtful. It appears probable that no such state exists between a solid and its liquid, unless the solid is crystalline; and its existence has not been established even for this case.

See MOLECULAR THEORY; GASES, GENERAL PROPERTIES OF; ELECTRON; SOLUTION; ETHER; VACUUM; etc. Consult, also, Tait, 'Properties of Matter'; Kimball, 'Physical Properties of Gases'; Poynting and Thomson, 'Properties of

Matter'; Risteen, 'Molecules and the Molecular Theory of Matter'; Lehmann, 'Molekularphysik.'

Matterhorn, mät'tĕr-hôrn, **Mount.** See Cervin, Mont.

Matteson, măt'ĕ-sȯn, **Tompkins Harrison,** American artist: b. Poughkeepsie, N. Y., 9 May 1813; d. Sherbourne, N. Y., 2 Feb. 1884. His early lessons in art were from an Indian; otherwise he was mostly self-taught until after the success of his 'Spirit of '76,' when he settled in New York and studied in the National Academy. From 1851 until his death his home was Sherbourne. For a time he was a member of the New York legislature. His themes were historical or from American country life, and his best known pictures are 'The First Sabbath of the Pilgrims,' 'Examination of a Witch,' 'Eliot Preaching to the Indians,' 'Rip Van Winkle's Return from the Mountains,' 'At the Stile,' and 'Foddering Cattle.'

Matthew, Gospel of. See Gospels.

Matthew Town. See Inagua, Great.

Matthews, măth'ūz **(James) Brander,** American author: b. New Orleans, La., 21 Feb. 1852. Graduated from Columbia in 1871, and from the Columbia Law School in 1873, he was admitted to the New York bar (1873), began to contribute to the magazines in 1873, later turned wholly to literature, and in 1892 was appointed professor of literature in Columbia. In 1898 he became professor of dramatic literature. He was a founder of The Players and Authors clubs, of the Dunlap Society and the American Copyright League, and of the Columbia University Press. In 1889–91 he was president of the Nineteenth Century Club. He wrote several dramatic works, among them 'This Picture and That'; 'A Gold Mine' (with G. H. Jessop); 'On Probation' (also with Jessop); and 'Peter Stuyvesant' (with Bronson Howard). His published volumes include, from an extensive list, the following: 'French Dramatists of the Nineteenth Century (1881); 'In Partnership' (with H. C. Bunner; 1884); 'A Secret of the Sea, and Other Stories' (1886); 'Pen and Ink' (1888); 'American Literature' (1896); 'Outlines in Local Color' (1897); 'A Confident To-morrow' (1898); 'The Action and the Word' (1900); 'The Historical Novel, and other Essays' (1901); 'Parts of Speech: Essays in English' (1901); 'The Development of the Drama' (1902). He is perhaps best known for his critical papers, marked by keen analysis and a style of much distinction. Some of his earlier writings appeared over the signature "Arthur Penn."

Matthews, Edmund Orville, American naval officer: b. Baltimore 24 Oct. 1836; d. 30 Jan. 1911. He was graduated from the United States Naval Academy in 1855 and served in the navy before the outbreak of the Civil War, in which he served with distinction. In 1869–73 he was in command of the torpedo boat corps at Goat Island, Newport Harbor, and he commanded the Brooklyn in the Asiatic squadron in 1885–7; he was a member of the board of inspection and survey in 1891–4, and in 1897 was raised to the rank of rear-admiral. He was appointed president of the examining board in 1898 and served until he was retired in that year.

Matthews, Franklin, American journalist: b. St. Joseph, Mich., 14 May 1858. He was graduated from Cornell University in 1883, was reporter and editor on the Philadelphia *Press* 1886–90, and since the last named year has been editor of the New York *Sun*. He has published 'Our Navy in Time of War' (1899); 'The New-born Cuba' (1899).

Matthews, Stanley, American jurist: b. Cincinnati, Ohio, 21 July 1824; d. Washington, D. C., 22 March 1889. He was graduated from Kenyon College in 1840, studied law and was admitted to the bar in 1842, when he established a practice in Maury County, Tennessee, but returned to Cincinnati in 1844 and engaged in practice there. He was editor of the Cincinnati *Herald,* an anti-slavery journal in 1846–9, and held various political offices, and in 1855–6 was a State senator. In 1858 he was appointed United States district-attorney for the southern district of Ohio, but at the outbreak of the Civil War in 1861 entered the volunteer service and was commissioned lieutenant-colonel and was a colonel when in 1863 he resigned to accept the seat of judge of the superior court of Cincinnati. He was elected United States Senator in 1877 after having acted as counsel before the electoral commission, and in 1881 he was appointed a justice of the Supreme Court of the United States.

Matthias, ma-thī'as, a disciple of Jesus, probably one of the 70, who was chosen by lot to take Judas Iscariot's place among the 12. Little is known of him. Even early legend confused him with Matthew, and an apocryphal gospel was attributed to him. In the Roman Catholic Church 24 February, in the Greek 9 August, is sacred to him. The 'Acts of Andrew and Matthias' make him a missionary in Africa.

Matthias (Ger. mät-tē'äs), emperor of Germany: b. Vienna 24 Feb. 1557; d. 20 March 1619. He was a younger son of Maximilian II. (q.v.). In 1612–19 he was emperor of the Holy Roman Empire, having been elected on the death of his brother Rudolf II. (q.v.) His reign was an unsuccessful one. He attempted in vain to suppress by decree the Catholic League and Protestant Union. In 1628 the Thirty Years' war began.

Matthias Corvinus, kŏr-vē'noos, The Great, king of Hungary: b. Klausenburg, Transylvania, 27 March 1443; d. Vienna 6 April 1490. The second son of John Hunyady, he was imprisoned in Bohemia by his father's enemies, who strongly but unsuccessfully opposed his candidacy for the crown of Hungary in 1458. Another party of opposition attempted to make the Emperor Frederick III. king of Hungary; but Matthias brought them to terms and in 1463 made peace with Frederick. By the Peace of Olmütz, 22 July 1479, he gained Silesia, Moravia, and Lausitz, and the succession to the crown of Bohemia. In his wars with the Turks he was equally successful and a part of Bosnia was ceded to him by the Porte. War broke out again with the Austrian emperor; Matthias invaded his territory and captured and held Vienna. His court was a centre of scholarly men and his library, called the Corvina, a famous collection. The internal administration of Hungary was greatly improved under Matthias.

Mat'ting. While this term is usually employed to designate floor coverings made from reeds and fibrous grasses, it is a generic term which includes not only the commercial mattings for house floors, which are made in Eastern countries, but a much wider range of articles useful in the domestic economy, and in other employments, such as screens and tatties, sleeping mats (used in India and the East), the matting employed by nurserymen for protecting hotbeds and cold frames, and even some forms of thatch. For the most part mattings are handwoven, in the finer varieties the warp being cotton or other yarns, and the filling the culms of various sedges, reeds and grasses, an example being the familiar Japanese mattings of the house-furnishing stores. In the Russian bast (q.v.) mattings for nurserymen's use, bast of the linden tree is employed for both warp and filling, very coarsely woven or plaited. The roots of the Khus-Khus (*Andropogon squarrosus*), a perennial grass of India, are woven into fragrant screens for open windows, and also made into awnings. The Taika rush mats of Formosa are famous as sleeping mats, and the best grades are said to be as fine and soft as cloth, resembling the best Panama hat weaving. Consul Davidson states that a mat of the highest grade, measuring 5 x 6 feet, requires the labor of a girl weaver 120 days, and such mats have sold for 60 to 70 yen (or about $40). The rush is an unidentified species, but sleeping mats are made from several species of *Cyperus* and *Scirpus* found in Asia, Africa and other countries.

The commercial mattings used for house decoration are for the most part of Chinese and Japanese manufacture. In Japan two species are employed, *Juncus effusus*, the Bingo-i mat rush, which is always manufactured into the costly mats used by the higher classes (and known as Tatamiomote), and *Cyperus unitans*, which is employed for the cheaper grades. The largest importer of these mats is the United States, England, Austria, and Germany, following in the order named. The qualities of the Bingo-i are named as follows: Kinkwanyen, manufactured at Okayama; first quality Aya-mushiro, second quality Aya-mushiro, Damask Aya-mushiro, common Aya-mushiro, manufactured at Bittiro. First quality Somewake-mushiro, common Somewake-mushiro, Damask Hana-mushiro, common Hana-mushiro, manufactured at Bingo; ordinary Hana-mushiro (best quality), manufactured at Chikugo. *Cyperus unitans* produces the Shichito-i mats which are chiefly manufactured in the Oita prefecture. The plant is cultivated both upon upland and irrigated lands. The varieties of mats from this species are known by names as follows: Kikai-ori Hana-mushiro, Damask Hana-mushiro, common Hana-mushiro (two forms), Seidaka Hana-mushiro, manufactured at Bungo. Mattings made from the two species above have been exported in a single year to the value of 650,000 yen, or over $400,000.

The Chinese and Korean mat rush is *Cyperus tegetiformis*, this species also being used for the manufacture of cuffs and sandals. The India commercial mattings are made chiefly from *Cyperus corymbosus* and *tegetum;* the latter being known as the Calcutta mat rush, while the former is used for the Tinnerelly mats which are the finest made in India. They are also made at Palghat, but these are not so fine. In the manufacture of the India mattings the culms are split into two or three parts and then woven into mats upon a warp of threads previously stretched across the floor of a room. The operator passes the culms with the hand alternately over and under the successive threads of the warp, and presses them home.

It would be difficult to enumerate all of the mattings made in different countries, though mention should be made of the fine and highly prized Niihau mats of Hawaii, produced from *Cyperus levigatus*. Matting is made in Spain and Morocco from *Juncus maritimus*, and in Italy from *Juncus acutus*. Two species of sword rush, *Lepidosperma gladiatum* and *L. flexuosum*, are used by the natives of Australia not only for mats, but for baskets and other articles, and *Lepironica mucronata*, found in Asia, Africa and Polynesia, supplies the fibre for the mats with which Chinese boatmen cover their cargoes.

In the United States a handsome and utilitarian form of floor matting is largely manufactured from Slough grass, *Carex filiformis*. Fully described under Fibre (q.v.).

The University of California has recently been experimenting with several species of matting rushes, chiefly *Juncus effusus*, and *J. robustus*, from which a fine sample of matting has been manufactured at a factory in Maine. There is a possibility therefore that rush matting may be produced in the United States, commercially, in the near future.

For matting fibres see also 'Dictionary Economic Products of India,' 'Descriptive Catalogue of Useful Fiber Plants of the World,' and 'The Island of Formosa,' by Jas. W. Davidson. The leaves of many species of palm, in different parts of the world, are used for native mats and mattings, though few of these ever reach commercial importance. See PALMS.

CHARLES RICHARDS DODGE.

Matting Fibres. See FIBRE.

Matto-Grosso, măt'too-grŏs'soo, Brazil, the westernmost state, bounded on the north by a range of mountains which separates it from Pará; east by the Araguaia, which separates it from Goyaz; southeast by the Parana, separating it from São Paulo; south by Paraguay; and west by Bolivia; area, 532,445 square miles. It is traversed, northwest to southeast, by a mountain chain, forming the principal watershed between the basins of the Amazon and the Rio de la Plata. From the mountains numerous streams descend through lofty rocky valleys, which gradually spread out into immense plains. The principal rivers are the Guapore, Juruena, Xingu, Araguaia, Parana with its tributary Pardo, and the Paraguay with its tributaries São Lourenço and Tacoary. The dense forests which cover a great part of the surface have given the province its name, Matto Grosso, signifying "Great Forest." They abound with inexhaustible supplies of the finest timber, and also yield many rare and valuable gums, balsams, and medicinal plants. Cacao, jalap, and *maté* are of spontaneous growth. Numerous wild animals infest the woods. The state is rich in minerals. There is scarcely a district in which gold has not been found, though the working of the mines has ceased to be profitable. Iron is abundant, but is unworked. Over an extensive region near the centre, diamond mines were long wrought, and at one time yielded a large revenue to the Portuguese government. In other quarters various other gems and crystals are obtained. In many of the valleys and plains the soil is of remarkable fertility, producing rich crops of rice, millet, mandioc, haricots, cotton, sugar, and tobacco; but the greater part of the surface remains in a state of nature. The state is represented in the chamber of deputies of the Federal government by four members, and in the Federal senate by three senators. Its internal affairs are administered by a state executive and legislature, the latter being chosen by popular vote. The capital of the state is Cuyaba. Pop. (exclusive of Indians) about 95,000.

Mattoon, ma-toon', Ill., city, in Coles County; on the Illinois C., the Peoria, D. & E., and the Cleveland, C. C. & St. L. R.R.'s; about 75 miles east by south of Springfield. It was settled and incorporated in the year 1855. It is situated in an agricultural region in which broom corn is one of the principal products. The chief manufacturing establishments are broom factories, flour mills, grain elevators, wagon and carriage factories, foundries, machine-shops, and repair shops for several railroads. It has a large trade in its manufactured articles, grain, fruit, and live-stock. Some of the prominent buildings are the Old Folks' Home (I. O. O. F.), the public and parish schools, the public library and reading room, and the churches. The electric-light plant is owned and operated by the city. Pop. (1890) 6,833; (1900) 9,622; (1910) 11,456.

Maturin, mā-too-rēn', Venezuela, a town in the state of Bermudez, formerly the capital of the state of Maturin, now united with Bermudez. It is on the Guarapiche branch of the Orinoco delta, 25 miles by rail above its port Colorado, and 40 miles from the sea. A considerable trade with the West Indies, principally in cattle and hides, is carried on. In the neighborhood are extensive plantations of cacao. Pop. about 15,000.

Matzoon', a milk food used in Armenia; prepared by exposing milk in open vessels to a heat of 90° F., and when coagulation takes place the curd is broken up by a churning process, and a little salt is added.

Mat'zoth, the Hebrew name for a kind of unleavened bread or biscuit eaten by the Jews during the feast of the Passover.

Mauch Chunk, mâk chŭnk, Pa., a town and county-seat of Carbon County, on the Lehigh River, the Lehigh Coal and Navigation Company's Canal, and on the Central of N. J., and the Lehigh V. R.R.'s; 46 miles west by north of Easton. The town is picturesquely built on the side of a mountain rising 1,500 feet from the river, here winding through a narrow, deep ravine, and each summer is visited by thousands of tourists, attracted by the beauty of the surrounding natural scenery. The town has a county building, Y. M. C. A. building, the Dimmick Memorial Library, is electrically lighted, and has electric street railways. It has a number of foundries, shoe factory, car shops, etc., but is best known as an important coal centre, marking the extreme boundary of the anthracite coal region of Pennsylvania; it was established by the Lehigh Coal and Navigation Company in 1818. The Summit Hill coal mines, nine miles southwest of the town, are among the best in the State. The coal is now carried through a tunnel, but was formerly transported to Mauch Chunk by a gravity railroad known as the Switchback, which has became famous as an exciting pleasure route for tourists. Mounts Pisgah and Jefferson, the summits of which are reached by the Switchback railroad; Prospect Rock, Flagstaff Peak, and Glen Onoko are points of considerable interest, commanding splendid views of the Lehigh Valley. Pop. (1910) 4,400.

Maud Mul'ler, a poem by J. G. Whittier, first published in the 'National Era,' December 1854. It is a ballad reciting a romantic passage in the lives of a susceptible judge and a country girl.

Maudsley, mâdz'lĭ, **Henry,** English alienist: b. Gigleswick, Yorkshire, 6 Feb. 1835. He was graduated in medicine from the University of London in 1857, was editor of the 'Journal of Mental Science' in 1863–78, in 1869–70 was professor of medical jurisprudence in University College, London, and in 1869 became a fellow of the Royal College of Physicians. A list of his works includes: 'Physiology and Pathology of the Mind' (1867); 'Lectures on Body and Mind' (1870); 'Responsibility in Mental Disease' (1874); 'The Physiology of Mind' (1883); 'Natural Causes and Supernatural Seemings' (1886).

Maule, mow'lā, Chile, a maritime province bounded north by the province of Talca, east by Linares and Nuble, south by Concepcion, and west by the Pacific Ocean. Area, 2,930 square miles. It takes its name from its principal river. The well wooded Coast Range, nearly 3,000 feet high, occupies the great portion of the surface. Agriculture and its allied occupations constitute the principal industries. Capital Caquenes; chief port Constitucion. Pop. of province about 120,000.

Maule, Chile, a river rising in the Andes and after a westerly course of about 150 miles, 52 of which are navigable for small vessels, flowing into the Pacific Ocean near the village of Constitucion, 99 miles northeast of Concepcion.

Maulmain, mâl-mān', or **Moulmein,** mowl-mīn', Burma, the capital of the Tenasserim division, and a seaport near the mouth of the Salwin River, on the Gulf of Martaban. The town, comparatively modern, dating from 1826, is regularly built on level ground between the river and a range of wooded hills, on whose heights are the gilded spires of numerous pagodas and elegant residences, commanding fine views of beautiful scenery. Maulmain has numerous public buildings, churches, chapels, and missionary establishments, several charitable and educational institutions, barracks, a hospital, jail, etc. A considerable trade is carried on with Indian ports, the chief exports being teakwood and rice, the imports, piece goods, hardware, provisions and general merchandise. Pop. about 60,000, besides native Burmese, comprising Hindus, Eurasians, Armenians, Chinese, Malays, Jews, and Europeans.

Maumee, mâ-mē', a river formed by the junction of Saint Mary's and Saint Joseph's rivers at Fort Wayne, Ind. It flows northeast across the northwest corner of the State of Ohio, and enters Lake Erie through Maumee Bay. The river is 150 miles long and navigable 12 miles from its mouth to the Maumee Rapids. The Miami and Erie Canal, which connects Lake Erie with the Ohio River, begins at the head of navigation on the Maumee, and follows the course of the river to Defiance, then turns south. The Maumee Bay, a shallow body of water, has been improved by deepening and straightening the channel. Toledo is at the mouth of the Maumee. The Maumee River was a part of one of the water routes much used by the early missionaries and explorers. The distance from the head waters of the Maumee to the Wabash River is only about 25 miles.

Mauna Kea, mow'nā kā'ä, Hawaii, an extinct volcano, the highest peak in the Pacific, 13,805 feet in altitude. See HAWAII.

Mauna Loa, mow'nä lō'ä, Hawaii, a volcano 13,760 feet high, with a crater nearly five miles in circumference, and vertical precipices on the inner side 500 to 600 feet high. Mauna Loa is situated in the central southern portion of Hawaii, and on its eastern slope is the still larger crater of Kilauea, about nine miles in circumference, but apparently having no communication with Mauna Loa, their periods of activity being independent of each other. See HAWAII; KILAUEA.

Maundy (mân'dĭ) **Thursday** is the Thursday in the Passion week. Another popular old name of the day is Shere Thursday, from the custom of shearing the hair which the priesthood used to observe. It used to be the custom in England and other countries, and still is in Austria, for the sovereign to wash the feet of a certain number of poor persons, and to send them away with presents in the shape of food, clothing, and money. This ceremony is in commemoration of the act of Christ, who washed his apostles' feet on the occasion of the last supper.

Maupassant, Henri René Albert Guy de, ŏṅ-rē rė-nā äl-băr gē dė mō-pä-säṅ, French novelist: b. Chateau Miromesnil, Seine-Inferieure, France, 5 Aug. 1850; d. Paris 6 July 1893. He began his career as a clerk in the navy department in Paris and also served for a time in the French army during the Franco-Prussian war. The novelist Flaubert, a friend of his mother's, was his godfather, and the youth took him as his model in the art of composition. After years of practice, during which he wrote and destroyed a great number of manuscripts, he allowed a short story, 'Boule de Suif,' to appear in 1880, a work which displayed the greatest finish and at the same time allied him to the naturalistic school of fiction. In the same year he published a book of verse, 'Des Vers,' and a drama, 'Histoire du vieux Temps.' After this he continued to cultivate the short story and was very soon recognized as one of the greatest writers of short stories the 19th century had seen. In spite of the perfection of art displayed in their construction neither his brief tales nor his novels form pleasant reading. They compel admiration, but they are dominated by pessimism and in his later work the traces of an unbalanced mind may be plainly seen. In 1892 De Maupassant's mental malady occasioned the cessation of literary occupation, two years later he became wholly insane, and he died the next year in an asylum. His collections of short stories include, 'La Maison Tellier' (1881); 'Mlle. Fifi' (1883); Les Sœurs Rondoli' (1884); 'Yvette' (1884); 'Contes du Jour et de la Nuit' (1885); 'Contes et Nouvelles' (1885); 'La Horla' (1887); 'La petite Roque' (1888); 'La Main gauche' (1889); 'Le Père Milon'; 'L'inutile Beauté' (1890); etc. The finest of his six novels is 'Pierre et Jean' (1888); the others are: 'Une Vie' (1883); 'Bel Ami' (1885); 'Mont Oriol' (1887); 'Fort comme la Mort' (1889); 'Notre Cœur' (1890). He also published several collections of travel sketches, such as 'Au Soleil' (1884); 'Sur l'Eau' (1888); 'La Vie errante' (1890). A collection of 13 of his short stories published in English with the title 'The Odd Number,' represents him at his best, both in point of art and as regards the stories themselves. The absence of a moral sense is less apparent here than elsewhere and there is less of gloom and animalism perceptible.

Maupertuis, Pierre Louis Moreau de, pē-ăr loo-ē mō-rō dė mō-pĕr-tü-ē, French mathematician and philosopher: b. St. Malo, France, 28 Sept. 1698; d. Basel, Switzerland, 27 July 1759. He entered the army in 1718 and after five years' service resigned in order to become instructor in mathematics in the Academy of Sciences. He went to England in 1728, where he was made a member of the Royal Society, and became a pupil of Newton. In 1736 he conducted a scientific expedition to Lapland for the purpose of measuring an arc of the meridian, the result of which was a confirmation of Newton's theory of the flattening of the globe at the poles. In 1743 he was elected to the French Academy, in 1744 was summoned to Prussia by Frederick the Great, and in 1746 was declared president of the Academy of Sciences at Berlin. A dispute with the philosopher König regarding the discovery of the infinitesimal calculus shortened his days. Among his works are: 'Sur la Figure de la Terre' (1738); 'Discours sur la Figure des Astres' (1742); 'Maupertiana ou divers Ecrits' (1753). Consult: De la Baumelle, 'Vie de Maupertuis' (1856); Damiron, 'Memoires sur Maupertuis' (1858).

Maurel, mō-rĕl, **Victor,** French singer: b. Marseilles 1848. He was educated at the Paris Conservatoire and made his début in Paris in 1869. His first appearance in Royal Italian Grand Opera was in 1873 and he achieved a signal success. He created Iago in Verdi's 'Otello' and has appeared in many operatic roles in Europe and United States, being generally recognized as the leading acting baritone actor on the Italian stage.

Maurepas, Jean Frédéric, zhŏṅ frā-dā-rēk mō-rė-pä, **Phélypeaux,** COMTE DE, French statesman: b. Versailles 9 July 1701; d. there 21 Nov. 1781. He became minister of state under Louis XV. in 1738, but in 1749 was banished the court for an attack on Mme. Pompadour. In 1774 he was made prime-minister by Louis XVI. The chief events of his administration were the restoration of the Parliament of Paris (12 Nov. 1774), and the alliance with and assistance of the American colonies in their struggle against Great Britain. Consult Guyot, 'Eloge Historique de M. de Maurepas' (1782).

Maurice, mâ'rĭs **(John), Frederic Denison,** English Anglican theologian and author, one of the leaders of the Broad Church movement: b. Normanston, Suffolk, 29 Aug. 1805; d. Cambridge 1 April 1872. He was son of a Unitarian clergyman; was educated at Trinity Hall, Cambridge; settled in London, where he was editor of the 'Athenæum' for several years; and having decided to take holy orders entered Exeter College, Oxford. In 1834 he became curate of Bubbenhall, and two years later chaplain to Guy's

Hospital. He became professor of history in King's College, London, in 1840, and of divinity as well in 1846, but was deprived of both chairs in 1853 because of the liberal tenor of his 'Theological Essays.' Up to 1860 he was chaplain of Lincoln's Inn, and from 1860 to 1869 incumbent of St. Peter's, Vere Street, London. In 1866 he was elected professor of moral philosophy at Cambridge. During his life in London Maurice founded the Working Men's College and Queen's College (for women), took a prominent part in various practical philanthropies, and was a leader of the Christian Socialists. He was a man of wonderfully sweet and beautiful character; a fervent preacher, who made much of the fatherhood of God; and a social reformer, whose lack of success was due to the fact that he was before his time. Among Maurice's works are 'Eustace Conway,' a novel (1834); 'The Epistle to the Hebrews'; 'Warburtonian Lectures' (1846); 'The Religions of the World'; 'Boyle Lectures' (1847); 'The Lord's Prayer,' sermons (1848); 'History of Moral and Metaphysical Philosophy' (1850–60); 'Ecclesiastical History of the First and Second Centuries' (1854); 'The Word "Eternal,"' urging that "eternal punishment" is not "everlasting punishment" (1863); 'Casuistry, Moral Philosophy, and Moral Theology' (1866); 'The Conscience' (1868). Consult the 'Life, chiefly told in his own Letters,' by his son (1884); Rogers, 'Men and Movements in the English Church' (1898).

Maurice of Nassau, Prince of Orange and Count of Nassau: b. Dillenburg, Nassau, 13 Nov. 1567; d. The Hague 23 April 1625. His father, William the Silent, was assassinated in 1584, and the 18-year-old boy was chosen stadtholder by the provinces of Holland and Zealand, and later by the other provinces, the command of the army being entrusted to him in 1587 by the States-General. He captured Breda, Zutphen, and Nimeguen in 1590–1, and by 1597 had wrested the principal towns of the Netherlands from the Spanish. But Ostend was lost in 1604 and in 1609 a truce was made with Spain for 12 years. Internal dissensions followed and Olden Barneveldt, leader of the aristocratic republicans and of the party of religious tolerance, was condemned to death (1619) on the charge of high treason, but actually because of his opposition to Maurice. The stadtholder renewed the war with Spain in 1621, immediately upon the expiration of the truce, and died at the very time he was negotiating an alliance with France and with England. The greatest general of his day he was personally cold and unscrupulous.

Maurice of Saxony, Duke and Elector of Saxony, German soldier: b. Freiberg 21 March 1521; d. near Sievershausen 11 July 1553. He succeeded his father, Henry the Pious, as duke of Saxony, in 1541; and although a Protestant refused to join the Schmalkald League. In 1548, two years after a secret treaty with the emperor, Maurice was made elector of Saxony. But he soon broke with the emperor, fathoming his purpose of crushing the German princes, and by a sudden show of force made Charles sign the Treaty of Passau 31 July 1552. On the 9th of July in the following year he defeated Albert of Brandenburg-Kulmbach, who had refused to accede to the Treaty of Passau, in the battle of Sievershausen, but died two days later of his wounds. Maurice was the foremost general and diplomat of his day in Germany, but he was entirely without scruple or principle, and played off one party against another until he was little trusted by either.

Mauricius, mâ-rĭsh'ĭ-ŭs, **Flavius Tiberius,** emperor of the East 582–602 A.D.: b. Arabissus, Cappadocia, about 539 A.D.; d. Chalcedon 27 Nov. 602 A.D. He served with distinction against the Persians, and for his abilities and character was made successor to Tiberius II. by that emperor. His reign was filled with wars. He was, however, one of the greatest and best of the Eastern emperors, a patron of the arts and sciences, and himself considerably learned. Phocas, one of his generals, commanding the army operating against the Avars, led a revolt against him, and he fled to Chalcedon, where he was murdered by Phocas' order. He wrote Στρατηγικά, a work on military affairs, published in a Latin version by Scheffer at Upsala in 1664.

Maurists, mâ'rĭsts, the members of the Congregation of St. Maur, to whom literature owes the stately tomes known as 'Benedictine Editions.' The Congregation had its origin in a reform of the Benedictines in the early part of the 17th century; it was supported by De Retz and afterward by Richelieu, and in 1720 possessed in France six provinces, containing 180 abbeys and priories. Among the most celebrated of the Maurists are Mabillon, Martene, Montfauçon, the founder of the science of archæology, Ruinart, Lami, Le Nourri, and Martianay. Jansenism seems to have affected some of the convents, and, according to Badiche, a Masonic lodge was established at Glanfeuil in 1755, over which the prior of the monastery in that place presided. The Congregation was suppressed in 1792.

Mauritania, mâ-rĭ-tā'nĭ-a, or **Mauretania,** Africa, the ancient name of the northwestern portion, corresponding to Morocco and western Algeria. It derives its name from its inhabitants, called by the ancients *Mauri,* a word equivalent to "Blacks." In 4[illegible] A.D. it became a Roman province. From 429 to 534 it was held by the Vandals, and in 650 it was conquered by the Arabs. See Morocco.

Mauritius, mâ-rĭsh'ĭ-ŭs, or **Isle of France,** an island colony of Great Britain, in the Indian Ocean, 500 miles east of Madagascar. It is of an oval form, about 40 miles in length from northeast to southwest, and 25 miles in breadth; area, 705 square miles. There are numerous capes and bays along the shore and the island is surrounded by coral reefs. It is composed chiefly of rugged and irregular mountains, rising into points of considerable height; the highest are the Montagne de la Rivière Noire, 2,730 feet, and the singular isolated rock Peter Botte, 2,700 feet. Between the mountains, and along the coast, there are large and fertile plains and valleys, having a rich soil of black vegetable mold or stiff clay, watered by numerous streamlets, many of which become periodically dry. The climate is pleasant during the cool season, but oppressively hot in summer, and the island is occasionally visited by severe epidemics of fever. The rainy season is from January to April; between December and March the island is subject to hurricanes, occasionally of extraordinary violence. When discovered in 1505 the island was almost entirely covered with wood, the greater part of which has now been cut down, although some extensive forests still remain. The fauna then included the dodo, but otherwise was in no way remarkable. Some of the trees are valuable, particularly the black ebony. The indigenous vegetation includes orchids, screw-pines, the traveler's-tree, bamboo, etc. Many plants introduced from Europe, Africa, Madagascar, and India thrive well, and nearly every beautiful tropical tree or delicious fruit is met with. The principal item of cultivation is sugarcane, and to a limited extent rice, maize, manioc, vanilla, coffee, spices, fruits, and tea, the last introduced recently. The value of the exports of unrefined sugar, which is the staple, amounted in 1901 to $8,792,784. Other exports are rum, vanilla, cocoanut oil, aloe-fibre, spice. The total value of exports in 1901 was $9,286,643; of imports, $6,780,452. The imports consist of rice, wheat, cottons, haberdashery, machinery, etc. The government is vested in a governor, an executive council, and a legislative council, the latter partly elected. The revenue for 1900 was $3,059,985, and the expenditure $2,856,315. The chief sources of revenue are the customs, licenses and permits, and the railways; the expenditure is chiefly on the civil service and on the railways, which have a total length of 105 miles. The currency is in rupees and cents. Schools are kept up partly by government, partly by private agencies. The highest institution is the Royal College, a school affiliated to London University. The French language and French law prevail in the colony, and the majority of the white inhabitants are of French origin. Mauritius was discovered in 1505 by the Portuguese. The Dutch took possession of it in 1598, and named it Mauritius in honor of Prince Maurice. It eventually fell into the hands of the French, from whom it was captured by the British in 1810, and it was definitely ceded to them in 1815. Principal towns, Port Louis, the capital, Curepipe, and Mahébourg. Rodrigues, Diego Garcia, the Seychelles, and some other islands of the Indian Ocean are dependencies of Mauritius. The scene of Bernardin de Saint Pierre's celebrated 'Paul et Virginie' is laid in this island. Pop. about 400,000, of whom two thirds were coolies (mainly imported to work the sugar estates).

Mauritius Hemp. See FIBRE.

Mau"rocorda'tos. See MAVROCORDATOS.

Maury, mâ'rĭ, **Dabney Herndon**, American military officer: b. Fredericksburg, Va., 21 May 1822; d. Peoria, Ill., 11 Jan. 1900. He was graduated from West Point in 1846 and served in the Mexican War. He was brevetted 1st lieutenant in 1847 for "gallant and meritorious conduct" at Cerro Gordo, and served in the United States Military Academy as instructor, 1847–52. At the beginning of the Civil War he was brevet-captain, but resigned to enter the Confederate army, where he attained the rank of department commander of the Army of the Gulf. He again served the United States government when under President Cleveland's first administration he was minister to Colombia. He published 'Skirmish Drill for Mounted Troops' (1859); 'Recollections of a Virginian in the Mexican, Indian and Civil Wars' (1894).

Maury, Matthew Fontaine, American naval officer and hydrographer: b. in Spottsylvania County, Va., 14 Jan. 1806; d. Lexington, Va., 1 Feb. 1873. He studied at the Harpeth Academy in Tennessee, and entered the United States navy in 1825. During a voyage around the world in the Vincennes he began a treatise on navigation, long used as a text-book in the navy. He was made lieutenant in 1836. In 1839, when he was lamed by an accident, he quitted active sea-service for scientific work at the Naval Observatory. His powers of application were combined with rare gifts of imagination, and an elevated style. His 'Physical Geography of the Sea and Its Meteorology' (1855) has been considered a book of fascinating interest. In 1844 he published his views on the Gulf Stream, ocean currents, and great-circle sailing. His 'Wind and Current Charts' have been of immense benefit to navigation. In 1853 he reached the rank of commander, and in that year projected the maritime conference at Brussels, and also published 'Letters on the Amazon and the Atlantic Slopes of South America.' In 1861, when the Southern States seceded, he gave his services to the Confederate cause. For some time he attached himself to the fortunes of the emperor Maximilian in Mexico; but for the last few years of his life was professor of physics at the Virginia Military Institute. He was among the first to turn fresh attention to a branch of scientific inquiry which had been previously much neglected, the investigation of the depths of the sea, its currents, temperature, etc. Consult Corbin, 'Life of Matthew Fontaine Maury' (1888).

Mauser, Paul, powl mow'zĕr, German inventor and gun-maker: b. Oberndorf-on-the-Neckar 27 June 1838. He worked as a boy in the royal armory at Oberndorf, and there with his brother Wilhelm (b. 2 May 1834; d. 13 Jan. 1882) patented several improvements on the small arms then in use, both new needle-guns and a model replacing the "needle" powerful percussion-pin. The introduction of the Prussian needle-gun into Würtemberg after the Austro-Prussian war deprived the brothers of the patronage of the government, and in 1867 he settled in Liège. Paul invented the Mauser revolver in 1879, having returned to Oberndorf in 1874. The "Mauser, 1882," was adopted by the Servian government in 1882. After that date he made the Turkish model in 1887, the Belgian repeating rifle in 1889, the Argentine model in 1891, the Spanish model in 1893 (adopted with slight change throughout South and Central America), and in 1896 a rifle for the Swedish army. The German models of 1898 and 1871–84 are largely due to him. Typical of his rifles are the Belgian model of 1889 and the Argentine of 1891, both magazine rifles with no cut-off, but capable of single fire by replacing the top cartridge in the magazine after each discharge. The magazine holds five cartridges, lies in front of the trigger guard and under the receiver, is fixed in type but easily cleaned. The gun can be charged through the receiver with one cartridge or the five from the magazine may be stripped together from a metal clip, independently of the mechanism of the magazine and pushed to the right on the closing of the bolt. See SMALL ARMS.

Mausole'um (Greek, *mausoleion*), a tomb or burial place, the name of which is derived from Mausolus, a king of Caria, to whom a sumptuous sepulchre was raised by his wife Artemisia, at Halicarnassus. King Mausolus died 353 B.C.;

and his wife was so disconsolate that she perpetuated his memory by the erection of this magnificent monument which became so famous as to be esteemed the seventh wonder of the world, and to give a generic name to all superb sepulchres. Its entire height was 140 feet, and the entire circuit 411 feet. It was overthrown, probably by an earthquake, between the 12th and 15th centuries; and when the knights of Rhodes took possession of Halicarnassus in 1404 they availed themselves of the materials of the mausoleum to erect the fortress of San Pietro. Other famous mausoleums are that erected at Babylon by Alexander the Great in honor of Hephæstion, equally magnificent with that of Mausolus, though less refined; and the mausoleum of Augustus, built by him in the sixth consulate on the Campus Martius, between the Via Flaminia and the Tiber, the ruins of which are still seen near the church of St. Roque. One of the obelisks which stood before this superb building was found in the reign of Pope Sixtus V. This mausoleum contained the ashes of Augustus, Marcellus, Agrippa, Germanicus, and of some later emperors. The mausoleum of Hadrian at Rome is now the Castle of San Angelo.

Mauston, mâs'tŏn, Wis., city, county-seat of Juneau County; on the Lemonweir River, and on the Chicago, Milwaukee & Saint Paul railroad; about 130 miles northwest of Milwaukee. The chief manufacturing establishments are lumber mills, machine shops, and flour mills. Pop. (1910) 1,701.

Mauvaises Terres, mō-vāz tĕr. See Bad Lands.

Mauve, mōv, an aniline purple coloring matter. See Dyes.

Mav'erick, Peter, American engraver: b. New York city 22 Oct. 1780; d. there 7 June 1831. He studied engraving under his father, worked especially on bank-note designs, and made famous engravings of Charles King's portrait of Henry Clay, of Waldo's portrait of Andrew Jackson, and of Dunlap's portrait of Benjamin Moore. Maverick was one of the founders of the National Academy of Design in 1826.

Maverick, an unbranded steer, especially one appropriated by a chance finder. This term, in common use in the cattle country of the United States, is said to be derived from the name of Samuel Maverick, a Texas lawyer and politician, who, having accepted a herd of 400 head of cattle in payment of a debt, left them in charge of one of his men. They were neglected and allowed to run wild, and when the calves were born they were of course appropriated by other ranchers and branded with their marks, and so passed to their undisputable ownership. As the ownership of the cattle was determined by the brand, it may easily be seen why the name «Maverick's» was given to all calves caught straying from the herd. From this use of the word grew a wider application to anything dishonestly come by.

Ma'vis, the Scottish name for the British songthrush or throstle (q.v.), one of the favorite song-birds of western Europe.

Mavor, James, English political economist: b. Stranraer, Scotland, 8 Dec. 1854. He was graduated from the University of Glasgow. He was for a time editor of the 'Scottish Art Review'; was university extension lecturer on political economy; in 1888 became professor of political economy at Saint Mungo's College, Glasgow, and in 1892 professor of political economy and constitutional history at the University of Toronto, Canada. He has written: 'Wages Theories and Statistics' (1888); 'Economic Theory and History Tables and Diagrams' (1890); 'Scottish Railway Strike' (1891); 'Currency Reform' (1891); 'Economic Study and Public and Private Charity' (1892); 'English Railway Rate Question' (1894); has edited 'Handbook of Canada' for 1897; and has prepared reports on 'Labor Colonies in Germany' (1893); 'Immigration into Canada from Europe' (1900), and 'Workmen's Compensation Acts' (1900). He has been interested in the currency question and has served as vice-president of the Bimetallic League.

Mavrocordatos, mäv″-rō-kŏr-dä'tŏs, or **Maurocordatos, Alexander,** modern Greek soldier and statesman: b. Constantinople, Turkey, 15 Feb. 1791; d. Ægina 18 Aug. 1865. He was a skilful linguist and early schooled in diplomacy. On the outbreak of the Greek war for independence (1821), he devoted his entire fortune to the equipment of a ship, and the arming of volunteers. He organized the insurrection in Ætolia and Acarnania, was made president of the national assembly at Epidaurus, drew up the provisional constitution, and signed the proclamation of independence (January 1822). He also became president of the executive council, but resigned in what he believed to be the interests of harmony. In 1833–4, 1841–3, 1844, and 1854–6 he was at the head of the cabinet, and in 1850–4 was ambassador at Paris. He promoted public education, and was a Liberal in politics, being of the British party and opposed to the Russian policy of Giovanni and Augustin Capo d'Istria. He is generally considered the most important leader in the Greek Revolution.

Max, mäks, **Gabriel von,** German painter: b. Prague 23 Aug. 1840. The son of a sculptor, with whom he studied for a time, he soon devoted himself to painting, then went to the Prague Academy under Engerth's teaching, and, after several years at Vienna, became a pupil of Piloty in Munich, where he was professor in the Academy from 1879 to 1883. His work is largely fantastic; he aims to interpret music, especially that of Beethoven, Mendelssohn, and Liszt; and is fond of psychic themes, although occasionally, as in his famous pictures of monkeys, going to an extreme of realism, explained by his earnest belief in Darwin and Haeckel. But he is best known for his historical and figure paintings, which usually show a female figure of some beauty and ethereal charm, with dreamy, longing, sentimental eyes. In such pictures as these the flesh tones are particularly remarkable, being sometimes styled marble-like and due to his early training as a sculptor, and again described as a twilight of sentiment, typifying the spiritual. To this class belong 'Spirit Greetings' (1879); 'The Last Token,' now in the Metropolitan Museum, New York (1874); 'Nydia' (1874); 'The Lion's Bride' (1875), and many book illustrations, notably those for Schiller's and for Lenau's poems, for Goethe's 'Faust' (the 'Marguerite before the Mater Dolorosa' being especially well-known), for Wieland's 'Oberon' and for Uhland's works. Max was ennobled in 1900.

Maxentius, măk-sĕn'shĭ-ŭs, **Marcus Aurelius Valerius**, Roman emperor: d. 27 Oct. 312. He was the son of Maximianus, and in 306 A.D., was proclaimed Augustus by the prætorians, and acknowledged by the people and senate of Rome, to whom Galerius had become hateful. Severus, sent by Galerius against him and his father, was compelled by Maximianus to retreat to Ravenna, and was put to death in 307. Galerius was likewise compelled to retreat and Maxentius, availing himself of an insurrection of the Africans under a certain Alexander, in 311, declared war against Constantine the Great. While Constantine pressed forward into Italy, Maxentius himself remained inactive at Rome, and did not go out to meet Constantine till he had passed unopposed across the Apennines. At the great battle fought shortly after, at Saxa Rubra near Rome, Maxentius was defeated, and perished in the Tiber as he tried to escape over the Mulvian Bridge.

Max'im, Sir Hiram Stevens, American inventor and engineer: b. Sangersville, Maine, 5 Feb. 1840. He was apprenticed to a carriage-maker in his youth; after several years in a machine-shop in Fitchburg, Mass., where he perfected his knowledge of mechanical engineering and drawing and supplemented his scanty education, he went to Boston as foreman in a factory of philosophical apparatus. From Boston he went to New York as employee of the Novelty Iron Works and Shipbuilding Company; took out patents for an automatic gas machine in 1867, and in 1877 for an incandescent electric light which would burn a month and a half. At about the same time he designed a process for flashing electric carbons and another for «standardizing» them. In 1881–2 he utilized the force of a gun's recoil to reload the gun and fire 770 shots a minute. The Maxim-Nordenfelt Company, combining Maxim's machine-gun patents with those of Nordenfelt, was formed in 1888, and reorganized in 1897 as Vickers Sons and Maxim. His other patents are for various smokeless powders and several motors, mostly driven by petroleum. Of late much of his time has been spent in studying aeronautics. He became an English subject because of the alleged unfairness toward him of the United States government, and in 1901 was knighted by Queen Victoria. He is a Chevalier of the Legion of Honor and a member of many scientific societies.

Maxim, Hudson, American inventor and engineer: b. Orneville, Maine, 3 Feb. 1853. Received an academic education with especial reference to the natural sciences and engineering, then took up the study of medicine. Entered the printing and subscription book publishing business at Pittsfield, Mass., in 1883, and sold nearly 500,000 copies of a book on penmanship and drawing, of which he was the author. Invented a new chemical ink and a new process of printing in colors. Gave up the publishing business in 1888 to take up the business of ordnance and explosives. He was the first to make smokeless gunpowder in the United States, the first to submit samples for trial to the United States government, and his was the first to be adopted. In 1890 he built a dynamite factory and smokeless power mill at Maxim, N. J., and it was there that the Maxim-Schupphaus smokeless powder was developed and perfected, made under inventions and patents of his and Dr. Robert C. Schupphaus. These patents were purchased by E. I. du Pont de Nemours & Co. of Wilmington, Del., in 1897. Invented process of making calcium carbide continuously by heat of incandescence of a molten carbide conductor now in general use. In 1901 he sold to the United States government the secret of the high explosive invented by him, known as Maximite. See Explosives.

He has invented a detonating fuse for high explosive projectiles. This fuse is incapable of exploding the Maximite charge prematurely. either in handling or transshipment of the projectiles, or in firing them from a gun, while it insures the certain explosion of the projectile after penetration.

Mr. Maxim has recently invented and perfected a new smokeless powder known as «Stabillite,» (q.v.) on account of its high stability, and for several years has been conducting experiments on a new automobile torpedo invented by him.

Maximianus I., măk-sĭm-ĭ-ā'nŭs, **Marcus Aurelius Valerius**, Roman emperor: d. February 310 A.D. He so approved himself by his services in the army that Diocletian selected him for his colleague, creating him first Cæsar (285), then Augustus (286), and at the same time conferred on him the honorary appellation of Herculius. Maximianus had the care of the Western Empire, while Diocletian undertook that of the Eastern. In 287 he was consul with Diocletian, and in the same year conducted a campaign in Gaul. After conducting several wars, in 303–304 he was for the 7th time made consul, having for his colleague Diocletian for the fifth time, with whom he abdicated 1 May 305. In the following year he was again invested with the imperial title by his son Maxentius, to whom his services against Severus and Galerius were of the most important kind. His son shortly after expelled him from Rome, and repairing to Gaul, in 308 caused himself to be proclaimed Augustus at Marseilles, but Constantine easily deposed him.

Maximilian I., măk-sĭ-mĭl'ĭ-ạn (Ger. māks-ē-mē'lē-ān), emperor of Germany: b. Neustadt, near Vienna, 22 March 1459; d. Wels, Upper Austria, 12 Jan. 1519. In 1486 he was elected king of the Romans, and succeeded his father, Frederick III., as emperor in 1493. He first became an independent prince by his marriage with Mary of Burgundy, the daughter of Charles the Bold, who died in 1477. This match involved him in a war with Louis XI., king of France, in which he was successful, though he was defeated at a later period by the Milanese. He was succeeded by his grandson Charles V.

Maximilian, Joseph, 1st king of Bavaria: b. Schwetzingen, Baden, 27 May 1756; d. Nymphenburg, near Munich, 13 Oct. 1825. He succeeded his uncle, Charles Theodore, as elector in 1799. He was a supporter of Napoleon, and gave his daughter in marriage to Eugene Beauharnais in 1806. In the same year his duchy was erected into a kingdom. In 1813, however, he was member of the league against the emperor, and thus retained his throne after the fall of Napoleon. His reign was distinguished by the introduction of many administrative reforms.

Maximilian, emperor of Mexico, known in his earlier life as Ferdinand Maximilian Joseph, Archduke of Austria: b. Vienna 6 July 1832; d. Queretaro, Mexico, 19 June 1867. He was the younger brother of Francis Joseph I., emperor of Austria (q.v.). He entered the Austrian navy in 1846, and in 1854 obtained the rank of rear-admiral, and was placed at the head of the Austrian marine. He was viceroy of the Lombardo-Venetian kingdom in 1857–9, and in 1857 married Princess Charlotte of Belgium, daughter of King Leopold I. On his return from a voyage made to Brazil for scientific purposes he fixed his residence at Miramar in the vicinity of Trieste, and there, 3 Oct. 1863, received a deputation from the Mexican Assembly of Notables, who offered him the crown of their country. He officially announced his acceptance 10 April 1864. He landed at Vera Cruz on 28 May and entered Mexico on 12 June. He set himself energetically to consolidate and develop his dominions, granted an amnesty to political offenders, and exhibited great interest in religious worship and education. But he failed to conciliate the Republican party, and as he did not restore to the clergy their confiscated estates they pronounced him a traitor. Meanwhile there were incessant conflicts between the partisans of President Juarez and the allied French and Imperial troops; and the decree of 2 Oct. 1865, by which the members of the Juarist bands and those who abetted them were to be regarded as bandits and shot, alienated the party of the Liberals. Juarez raised the standard of independence. Complications and misfortunes thickening around Maximilian rendered his position critical in the extreme. The empress in vain undertook a mission to Europe to enlist support for her husband, and grief and disappointment overthrew her reason. The French troops, largely by reason of the representations of the United States government, were withdrawn by Napoleon in March 1867; but Maximilian decided to remain in the hope of being able to maintain the empire. While bravely defending Queretaro against a Liberal force under Escobedo, he was betrayed by General Lopez on the night of 14 May 1867. Tried by court-martial, he was sentenced, with his principal officers, to be shot. The sentence was carried into effect on the morning of 19 July. Maximilian's body was after some delay surrendered to his relatives, and his funeral was celebrated with great pomp in the cathedral of Vienna on 18 Jan. 1868. Maximilian was a man of eminent abilities, and high and varied culture. His collected writings are contained in a posthumous publication entitled ‹Aus meinem Leben: Reiseskizzen, Aphorismen, Marinebilder› (1867), which gives ample testimony to the vigor of his intellect and the variety of his attainments. See MEXICO, *History*.

Maximinus, măk-sĭ-mī'nŭs, **Caius Julius Verus,** Roman emperor: d. Aquileia 238 A.D. He was at first a shepherd in Thrace, and when about 20 years of age became a soldier in the Roman armies, where he was distinguished by his gigantic stature. His capacity for fighting procured him rapid advancement, and under Alexander Severus he had the command of a legion on the Rhine. In 235 A.D. he took part in a conspiracy against Alexander, and after his murder of the latter by the soldiers was proclaimed emperor. The Gordiani having been proclaimed in Africa, Maximinus hastened to Italy and laid siege to Aquileia. He was there murdered by his soldiers.

Maximite, a high explosive employed as a bursting charge for projectiles, invented by Hudson Maxim (q.v.), of New York city. The secret of the invention, and the exclusive right to the use of the explosive, was purchased by the United States government in 1901, after very exhaustive trials at Sandy Hook proving grounds. Maximite was the first high explosive to be successfully employed as a bursting charge for armor-piercing projectiles. This explosive, while it is claimed to be 50 per cent more powerful than ordinary dynamite, is so insensitive that it will not only safely withstand the shock of discharge from the gun, but will also stand the far greater shock of penetrating armor-plate as thick as the projectile containing it is capable of passing through, the projectile being then exploded immediately behind the plate with a delay action detonating fuse.

Ignited in the open, maximite simply burns like pitch. Projectiles are charged with it by the simple process of melting and pouring, the explosive solidifying on cooling, and adhering firmly to the walls of the shell. Maximite is known to be a picric acid compound.

Maximus Magnus, Roman emperor: b. in Spain; d. 388. In 383, while commanding the Roman army in Britain, he proclaimed himself emperor. Gratian marched against him, but was defeated and assassinated, and Maximus, having made himself master of Gaul, Britain, and Spain, fixed the seat of his empire at Treves. He then advanced into Italy, and was besieged in Aquileia by the Emperor Theodosius, who caused him to be beheaded.

Max'well, Augustus Emmett, American jurist: b. Elberton, Ga., 21 Sept. 1820; d. Shipley, Fla., 5 May 1903. He was educated in Alabama and in the University of Virginia; settled in Tallahassee, Fla., in 1845; was a member of the State legislature, then secretary of state, and later attorney-general; was elected to Congress in 1853, serving until 1857; and from 1862 to 1865 was a member of the Senate of the Confederate States, of which, with the exception of ex-Senator Vest, he was the last survivor. After the war he was judge of the supreme court of Florida (1866), circuit judge (1877–85), and chief justice of the State (1887–91).

Maxwell, SIR Herbert Eustace, 7TH BARONET OF MONTEITH, Scottish author: b. Edinburgh 8 Jan. 1845. He was educated at Oxford, was junior lord of the treasury 1886–92, and is president of the Society of Antiquaries of Scotland. Among his many publications are: ‹Noontide Essays› (1892); ‹Scottish Land Names› (1894); ‹Rainy Days in a Library› (1896); ‹Sixty Years a Queen› (1897); ‹Life of the Duke of Wellington› (1899); ‹Memoirs of George Romney› (1902); ‹The Creevy Papers› (1903).

Maxwell, James Clerk, Scottish natural philosopher: b. Edinburgh 13 Nov. 1831; d. Cambridge, England, 5 Nov. 1879. He was educated at Edinburgh and at Trinity College, Cambridge, and in 1856 was appointed professor of natural philosophy in the Marischal College, Aberdeen, and held that office till its amalgamation with King's College to form the University of Aberdeen in 1860, when he was appointed to a similar chair in King's College, London. In 1857 he obtained the Adams prize at Cambridge for an essay 'On the Stability of Motion of Saturn's Rings.' From 1855 to 1872 he published his investigations on 'Perception of Color, and Color Blindness,' which obtained for him the Rumford medal and his election as F. R. S. He resigned his chair in 1865, and in 1871 was elected unopposed to the newly founded chair of experimental physics at Cambridge. He directed the formation of the Cavendish laboratory founded by the Duke of Devonshire and opened in 1874. In 1871 he published his 'Theory of Heat,' which has gone through several editions. In 1873 appeared his great work, 'Electricity and Magnetism.' Maxwell's fame will rest on his being the one who took the first grand step toward the discovery of the true nature of electrical phenomena. He rejected the theory of electrical "action at a distance," and sought to explain all electrical and magnetic phenomena as the results of local strains and motions in a medium whose contiguous parts only act on one another by pressure and tension. His scientific papers have been collected by W. D. Niven (1890). Consult: Campbell and Garrett, 'James Clerk Maxwell' (1882); Glazebrook, 'James Clerk Maxwell and Modern Physics' (1896).

May, Edward Harrison, American artist: b. London, England, 1824; d. Paris, France, 17 May 1887. He came to America when a boy, studied civil engineering, and then devoted himself to painting, working first under Daniel Huntington in New York and then under Couture in Paris. He painted portraits and historical and genre subjects; and his best pictures are the portaits of Laboulaye (1866), in the Union Club, New York, and Anson Burlingame (1869); and 'The Dying Brigand' (1855), now in the Philadelphia Academy of Fine Arts; 'Milton Dictating to his Daughters'; and 'Mary Magdalene at the Sepulchre.'

May, Georgiana Marian Craik, English novelist: b. London, England, April 1831; d. Saint Leonard's, Sussex, 1 Nov. 1895. She was a daughter of G. L. Craik (q.v.) and was married to A. W. May. Her principal novels, which are concerned mainly with domestic life, are: 'Riverstone' (1857); 'Lost and Won' (1859); 'Winifred's Wooing' (1862); 'Mildred' (1868); 'Sylvia's Choice' (1874); 'Hilary's Love Story' (1880); 'Godfrey Helstone' (1884); 'Patience Holt' (1891); 'Dorcas'; 'Only a Butterfly'; 'Anne Warwick.'

May, Phil, English illustrator: b. Leeds 22 April 1864; d. Camden Hill 5 Aug. 1903. He was son of an engineer; had his schooling in Leeds; was apprenticed there to a lawyer, whom he soon left to join a company of players; for them he designed posters; and in 1884 and 1885 began drawing for 'Society' and 'St. Stephen's Review.' After his marriage he went out to Sydney, Australia, where he gained some fame as artist of the *Bulletin,* and was forced by the exigencies of newspaper illustration to a very scanty use of line and a complete omission of anything else. In 1887 he went to Paris; returned to his work on 'St. Stephen's Review'; then began to draw for 'Graphic,' traveling through America; and shortly after Du Maurier's death was taken on the staff of 'Punch.' He must rank with Leech, Tenniel, and the other great British caricaturists. His art was remarkably simple and telling, his method, it is said, being to reduce an elaborate and detailed drawing to the fewest possible lines. He was particularly happy in his portrayals of London street-life, which are full of humor and sympathy; his Parliament sketches are only less felicitous and the likenesses in them are excellent. His own hatchet face, "banged" hair, and ever-present cigar figure in many of his sketches. From 1892 to his death he published 'Phil May's Annual.' His other collections of drawings are: 'Parson and Painter' (1891); Phil May's Sketch Book' (1896), and 'Phil May's Gutter-Snipes' (1896).

May, Samuel, American reformer and Unitarian clergyman: b. Boston, Mass., 11 April 1810; d. Leicester, Mass., 24 Nov. 1899. He was graduated from Harvard in 1829, and from the Harvard Divinity School in 1833. In 1834 he became pastor of the Unitarian Church at Leicester, Mass.; but when his strong abolitionist views became unacceptable to his parishioners, he resigned (1846). He was secretary of the Massachusetts Anti-Slavery Society from 1847 to 1865, and secretary of the American Anti-Slavery Society for several years, and was continually active in the abolition movement. After the Civil War he interested himself in many other reforms, and in 1875 was elected to the State legislature. He was a frequent contributor to the 'Liberator' and 'Anti-Slavery Standard'; and published 'The Fugitive Slave Law and its Victims.'

May, Samuel Joseph, American Unitarian clergyman and reformer: b. Boston, Mass., 12 Sept. 1797; d. Syracuse, N. Y., 1 July 1871. He was graduated from Harvard in 1817, studied for the ministry at Cambridge, was ordained at Boston to the Unitarian ministry 14 March 1822, and was pastor of churches at Brooklyn, Conn., 1822–36, South Scituate, Mass., 1836–42, and Syracuse, N. Y., 1845–67. In 1842–4 he was principal of the girls' normal school at Lexington, Mass., and in 1867–71 did missionary work in Central New York for the American Unitarian Association. As early as 1826 he was known as a preacher and writer against slavery, and for his advocacy of immediate emancipation was burned in effigy at Syracuse in 1830. In 1833 he was one of the organizers of the National Anti-Slavery Society, and was a signer of Garrison's "Declaration of Sentiments." From 1835 to 1853 he was general agent of the Massachusetts Anti-Slavery Society, and in connection with this post traveled extensively and spoke frequently. His life, like that of many another abolitionist, was often in danger, and he was repeatedly mobbed. He was among the more conservative anti-slavery leaders in his methods, and was prominent also in charity and education. His 'Recollections of the Anti-Slavery Conflict' (1868) is a highly valuable work. Consult Mumford, 'Memoir of S. J. May' (1873).

May, Thomas, English dramatist and historian: b. Mayfield, Sussex, 1594; d. London 13 Nov. 1650. He was educated at Cambridge, became a member of Gray's Inn and figured brilliantly at court. He published: 'Antigone,' 'Cleopatra,' 'Agrippina,' and other dramas and translations of the 'Georgics' and Lucan's 'Pharsalia.' He espoused the cause of Parliament in the Civil War, was made secretary and historiographer to Parliament, and wrote 'History of the Parliament of England, 1640–3' (1650; several times republished), and a 'Breviary' of the same history (1650).

May, Thomas Erskine, Baron Farnborough, English historian: b. London 8 Feb. 1815; d. Westminster 17 May 1886. He was educated at Bedford grammar-school, became assistant librarian to the House of Commons in 1831, and was called to the bar in 1838. He was appointed examiner of petitions for private bills in 1846, and clerk to the House of Commons in 1871. He was knighted in 1866, and just prior to his retirement from office in 1886, was raised to the peerage. He is best known as an antiquarian and historian. His chief works are: 'A Practical Treatise on the Law, Privileges, Proceedings, and Usages of Parliament' (1844; 10th ed., much enlarged, 1893); 'Constitutional History of England since the Accession of George III., 1760–1860 (1861–3; republished with supplementary chapter, 1871); 'Democracy in Europe: a History' (1877). In 1854 he collected and reduced to writing the 'Rules, Orders, and Forms of Procedure of the House of Commons.'

May, the 5th month of the year, having 31 days. It was 2d in the old Alban calendar, 3d in that of Romulus, and 5th in that of Numa Pompilius. The etymology of the word is doubtful. It was called Maius by Romulus, in respect to the senators and nobles of his city, who were called Majores, as the month following was called Junius, in honor of the youth of Rome who served him in war and were named Juniares. Some etymologists are of opinion that it was called Maia, from the goddess of that name, the mother of Mercury, to whom they offered sacrifices on the first day of the month. The sun enters Gemini during May, and the plants of the earth generally begin to flower. See Calendar.

May Apple. See Mandrake.

May Beetle, or June Bug, popular names for the clumsy brown beetles of the genus *Lachnosterna* (family *Scarabæidæ*) common throughout the United States. The adults fly by night during late spring and often are troublesome upon the young foliage of trees and shrubs. They are attracted by light and may be trapped in this way. The larvæ are large, brown-headed, white-bodied grubs which feed upon the roots of grass, etc., passing one or more years in the ground. For this reason strawberries and other crops which they attack should not be planted upon freshly turned sod land. Late fall plowing is often practised to destroy them.

May-bird, a gunner's name for various shore-birds which return from the South in the month of May, especially the Knot (q.v.). In New England the black-bellied plover, and in the South a curlew, are called May-birds or May-cocks.

May Cherry, a local name for the service-berry bush. See Amelanchier.

May-fly, Shad-fly, or **Day-fly**, members of the order *Ephemeridæ*. The species, of which about 300 have been described, nearly one third of which are North American, are fragile insects with large fore-wings, small or wanting hind-wings, short antennæ, atrophied mouth parts, and two or three thread-like abdominal filaments. Being greatly attracted to lights, the adults are often a source of annoyance in lake-side and river-side towns, and are sometimes especially troublesome in obscuring the lights from light-houses. The eggs are laid in fresh water either upon the surface or upon the bottom, the female diving for this purpose. The larvæ, which feed mainly upon vegetable matter, are active creatures with strong legs, abdominal tracheal gills and anal appendages. They live upon the bottom, under stones, covered with mud, or in burrows. After moulting about ten times wing pads appear, and these increase with each moult until the last, which may be number twenty. This occurs in the open air, the one previous to which occurs at the surface of the water, the insect escaping from its sub-imago skin rather suddenly. One striking difference the adults exhibit is the development of paired sexual organs, which do not appear in other orders of insects. The larvæ may take three years to develop; the adults live only a few days, lay their eggs and die. Both adults and larvæ are important food for fishes, and consequently they form a favorite bait with anglers, and are imitated in making artificial flies.

Maya (mī'ä or mä'yä) **Indians**, the aboriginal race or people of Yucatan (q.v.). At one time they were the most advanced of American Indian races, but the descendants of the race to-day are sadly degenerated. The Mayas of ancient days had a written language and left numerous examples of MSS., letters and picture writing. They made wooden covers for their books, and manufactured paper from leaves or vegetable fibre, joined edge to edge and folded like a fan. Over the whole page were pictures painted in all sorts of colors, which was their way of writing.

The Mayas and Aztecs (q.v.) had much in common. Their religions were related; both adored many of the same deities — especially the sun. Both worshipped idols carved from stone, and both sometimes sacrificed human victims. Among the Mayas there may have been a greater tendency toward a monarchical government than among the Aztecs; but here, too, an elected council was the real power. In method of warfare the two people were much alike, but the Mayas, though brave, were not so warlike as the Aztecs and paid more attention to agriculture and the arts. The people lived well, dressed in cotton of their own raising and weaving, made many ornaments of gold and greenstone, and were expert feather-workers. They surpass all American tribes in their architecture and in their carving in stone. Though without iron tools, they were able to erect fine buildings of stone, carved with remarkable and beautiful designs. In the wild forests of Yucatan and Central America, in the midst of dense tropical woods, overgrown with trees and tangled vines, are the deserted ruins of upward of 40 ancient towns. These different towns were connected by paved roads of stone, over which couriers ran, carrying letters, along which traders bartered and dickered, and on which the forces of one town would often march out to capture and sack some other town. In many cases the buildings were set upon a great flat-topped mound, with sloping sides and rectangular base and summit. These buildings were sometimes constructed around the sides of a square court, the doors all opening into the court. Such buildings were doubtless the houses in which dwelt many families, as in the pueblo houses in New Mexico. There are also temples for purposes of worship. In such there is usually found a tablet in the wall and an altar for sacrifice. The interior decoration of rooms was often elaborate, the walls being covered with stucco, on which were painted in brilliant colors paintings which furnish us much information of the dress, manners, gods, and worship of the people. Often these designs are in low relief. One of the most famous Mayan works of art is in the temple at Palenque, where is a remarkable tablet on which is represented a sacrificial scene. Copan is a most interesting Mayan town.

Mayaguez, mä-yä-gwas′, Porto Rico, a seaport city on the Mayaguez River near the west coast, the capital of Mayaguez Department, 72 miles southwest of San Juan. The city was founded in 1752 and has a modern appearance, with wide streets, fine buildings, electric lights and a street railway. It has a large but shallow harbor, and its port is three miles distant at Mayaguez Playa, where a considerable export trade in coffee and oranges is carried on. Pop. about 20,000.

May′brick, Michael («STEPHEN ADAMS»), English composer: b. Liverpool about 1845. He studied music in Italy and Germany, and was for many years a leading baritone vocalist in concerts and English opera. As a writer of songs over the signature «Stephen Adams,» he has been widely popular in this country and England. Among the best known of his many songs are: ‹Nancy Lee›; ‹Alsatian Mountains›; ‹The Holy City›; ‹A Warrior Bold.›

Mayence, mā-yŏṅs. See MAINZ.

Mayer, mā′ėr, **Alfred Marshall,** American physicist: b. Baltimore 13 Nov. 1836; d. Maplewood, N. J., 13 July 1897. He studied at St. Mary's College, Baltimore; spent two years in a machine-shop and draughting-room; specialized in chemistry and physics; became professor of these branches in the University of Maryland (1856), and in Westminster College, Fulton, Mo. (1859); after two years of study in Paris, was appointed to a chair in Pennsylvania College, Gettysburg (1865); went thence to Lehigh University in 1867; and from 1871 to his death was professor of physics in Stevens Institute, Hoboken, N. J. There he made important researches in acoustics; invented the topophone, an apparatus to detect the phases of sound vibration; discovered five methods of analysis of compound sounds into their elementary tones; and stated the law of tuning-fork vibration. He wrote many papers for the ‹American Journal of Science,› notably a series entitled ‹Researches in Acoustics›; several contributions to the ‹Scientific American Supplement›; ‹Lecture Notes on Physics› (1868); ‹The Earth a Great Magnet› (1872); ‹Light› (1877); and ‹Sound› (1878).

Mayer, Brantz, American author: b. Baltimore 27 Sept. 1809; d. there 21 March 1879. He was educated at St. Mary's College, Baltimore, studied law by himself during an Oriental voyage in 1827–8 and then at the University of Maryland; was admitted to the bar in 1829; and after a year in Mexico as secretary of legation wrote ‹Mexico as it Was, and as it Is› (1844). In the same year he founded the Maryland Historical Society. In the Civil War he sympathized with the Union, was president of the Union State General Committee, and from 1863 to 1871 paymaster in the U. S. army. His best book was ‹Captain Canot›; a story of the slave trade founded on fact. He also wrote ‹Mexico, Aztec, Spanish, and Republican› (1851); ‹Mexican Antiquities› (1858); ‹Memoir of Jared Sparks› (1867), and ‹Baltimore as it Was, and as it Is› (1871).

Mayer, Constant, American artist: b. Besançon, France, 4 Oct. 1852; d. 1901. A student at the School of Fine Arts in Paris, he left his studies in 1857 and settled in New York, where his sketches and portraits won immediate success. His portraits of Grant and Sherman and his life-sized genre paintings, such as ‹Maud Müller›; ‹The Song of the Shirt›; ‹Evangeline,› gained favor. From 1866 he was an associate of the National Academy of Design.

Mayer, Frank Blackwell, American artist, brother of Alfred Marshall Mayer (q.v.) and nephew of Brantz Mayer (q.v.): b. Baltimore 27 Dec. 1827. He studied art there under A. J. Müller, and under Gleyre and Brion in Paris and then settled in Annapolis. He made a special study of Dakota Indian types; contributed to ‹Harper's› and ‹Century› various articles with his own illustrations; and exhibited in the Paris Salon and at the Centennial Exhibition of 1876, where he received a medal for two pictures, ‹The Continentals› and ‹Attic Philosopher.› Among his other canvases are ‹Feast of Mondawmin›; ‹The King's Fool›; ‹The Trappist›; ‹Maryland in 1750›; ‹Crowning a Troubadour,› and ‹The Treaty of Traverse des Sioux.›

Mayer, Henry, American caricaturist: b. Worms, Germany, 18 July 1868. Educated in Germany and England, he at first followed a business career in the latter country, but emigrating to the United States in 1887, soon won for himself a distinct place as caricaturist, by his designs and illustrations for American and European papers. Since 1893 he has resided in New York. His works are: ‹Autobiography of a Monkey› (1896); ‹In Laughland› (1899); ‹Fantasies on Ha-Ha› (1899); ‹A Trip to Toyland.›

Mayer, mī′ĕr, **Julius Robert von,** German physicist: b. Heilbronn, Würtemberg, 25 Nov. 1814: d. there 20 March 1878. He was educated at the gymnasium in Heilbronn, studied medicine at Tübingen, and finished his university studies at Munich and Paris. In 1840 he went to Java as a ship's surgeon, and while there turned his attention to studies of the blood, extending his work to exhaustive investigations of animal heat, to which he applied the mechanical theory. Returning in 1841 to Heilbronn, where for some years he practised his profession, he became deeply engrossed with his scientific labors, and in 1842 published in Liebig's ‹Annalen der Chemie und Pharmacie› a preliminary statement of his revolutionary theory of heat, together with his views on the conservation and

From the Painting by Halsall, now in Plymouth Hall.

THE MAYFLOWER IN PLYMOUTH HARBOR.

correlation of energy. Three years later he re-stated his results, at the same time giving a forecast of his theory of the meteoric origin of the sun's heat. Contemporaneously with Mayer the mechanical theory of heat was worked out independently by J. P. Joule (q.v.) in England, and a controversy arose regarding the priority of discovery. The Royal Society gave Mayer the Copley medal in 1871, and two years before his death he was ennobled by the king of Würtemberg. His collected works appeared in 1867 under the title of 'Die Mechanik der Wärme.' Consult Weyrauch, 'Robert Mayer' (1890), and Gross, 'Robert Mayer and Hermann von Helmholtz' (1898).

May'fair, London, England, a fashionable neighborhood in the «West End» adjoining Belgravia. See LONDON.

May'field, Ky., city, county-seat of Graves County; on the Illinois Central railroad; about 30 miles from the Mississippi River and 25 miles from the Ohio at the mouth of the Tennessee. It was settled about 1820 and incorporated in 1850. It is in a fertile agricultural region in which the chief product is tobacco. Mayfield has large tobacco warehouses and factories, clothing factories, woolen mills, fire-clay works, flour and lumber mills. It has an extensive trade in tobacco. The mayor is elected once in four years; the council acts upon the appointments of the executive. Pop. (1890) 2,909; (1900) 4,081; (1910) 5,916.

May'flower, The, the name of the vessel in which the Pilgrim Fathers, or first colonists in New England, sailed to this country in 1620. The Mayflower was a vessel of 180 tons. She set sail from Southampton, England, on 5 Aug. 1620, in company with her sister ship, the Speedwell, but the courage of the captain and the crew of the latter vessel failing, both ships put back to port. Finally on 6 September the Mayflower again spread her sails from Plymouth, having on board as passengers 41 men and their families, 102 persons in all. They succeeded in crossing the Atlantic, after a stormy voyage of 63 days. They intended to go to the mouth of the Hudson River but the captain of the Mayflower took them to Cape Cod. They landed at Plymouth, Mass., at a point where Plymouth Rock (q.v.), a huge granite boulder, stands at the water's edge. A complete and authentic list of the male passengers who landed from the Mayflower is as follows:

THE MAYFLOWER PASSENGERS.

Allerton, Isaac
Allerton, John
Billington, John
Bradford, Wm.
Brewster, Wm.
Britterage, Richard
Brown, Peter
Carver, John
Chilton, James
Clarke, Richard
Cook, Francis
Crackston, John
Dotey, Edward
Eaton, Francis
English, Thos.
Fletcher, Moses
Fuller, Edward
Fuller, Samuel
Gardiner, Richard
Goodman, John
Hopkins, Stephen
Howland, John
Leister, Edward
Margeson, Edward
Martin, Christopher
Mullins, William
Priest, Degony
Rigdale, John
Rogers, Thomas
Soule, George
Standish, Miles
Tilly, Edward
Tilly, John
Tinker, Thomas
Turner, John
Warren, Richard
White, William
Williams, Thomas
Winslow, Edward
Winslow, Gilbert

With these 41 male passengers and heads of families came 15 male servants, whose names were as follows:

SERVANTS ON THE MAYFLOWER.

Carter,
Coper,
Ely,
Holbeck,
Hooke,
Langemore,
Latham,
Minter,
Moore,
Prower,
Sampson,
Story,
Thompson,
Trevore,
Wilder.

The following is a copy of the covenant agreed upon by these first settlers of Massachusetts, signed and subscribed on board the Mayflower at Cape Cod, 11 Nov. 1620, two days after the ship came to anchor:

THE MAYFLOWER COMPACT.

In the name of God Amen! We whose names are under-written, the loyal subjects of our dread sovereign Lord, King James, by the grace of God, of Great Britain, France and Ireland, King, Defender of the Faith, etc., have undertaken for the glory of God and the advancement of the Christian faith, and honor of our King and Country, a voyage to plant the first colony in the northern parts of Virginia; do by these presents, solemnly and mutually, in the presence of God and of one another covenant and combine ourselves together into a civil body politic for our better ordering and preservation, and furthermore of the ends aforesaid; and by virtue hereof to enact, constitute and frame just and equal laws, ordinances, acts, constitutions, and offices from time to time, as shall be thought most mete and convenient for the general good of the colony; unto which we promise all due submission and obedience. In witness whereof we have hereunto subscribed our names, at Cape Cod, the 11th of November, in the year of the reign of our sovereign Lord, King James of England, France and Ireland, the Eighteenth, and of Scotland the Fifty-fourth, Anno Domini 1620.

Whittier, Lowell, Holmes, and other poets have immortalized the Mayflower in well known poems.

Mayflower Descendants, Society of, an American patriotic society founded in New York city 22 Dec. 1894. Its membership is confined to lineal descendants of any passengers on the Mayflower, the voyage of which terminated at Plymouth Rock, Mass., in November 1620. There are also numerous State societies of a similar character. There are more than 2,000 members of the society.

Mayflower. See ARBUTUS, TRAILING.

May'hem, in law, the maiming of one person by another, the destroying or disabling of an arm, leg, hand, or foot, putting out an eye, etc. Mayhem renders the perpetrator liable to a civil action for damages, and also to a criminal prosecution.

Mayhew, mā'hū, **Experience,** American missionary: b. Martha's Vineyard, Mass., 27 Jan. 1673; d. there 29 Nov. 1758. He took charge of a half-dozen congregations of Indians, and in 1709 executed for the Society for the Propagation of the Gospel in New England a translation of the Psalms and of the Gospel according to St. John into the Indian tongue. His principal writing is 'Indian Converts' (1727), containing accounts of 30 Indian ministers and 80 other Indian Christians.

Mayhew, Henry, English journalist and author: b. London 25 Nov. 1812; d. 25 July 1887. In 1831 he started, with Gilbert A'Beckett, a periodical called 'Figaro in London': in 1841 produced, with A'Beckett, the farce of the 'Wandering Minstrel'; and not long after formed a literary partnership with his brother Augustus, the «Brothers Mayhew,» as they came to be familiarly known, turning out a number of most successful works of amusing fiction. Among these may be mentioned: 'The Greatest Plague of Life, or the Adventures of a Lady in Search of a Good Servant' (1847); 'The

Image of His Father, or One Boy is More Trouble than a Dozen Girls’ (1850); ‘Living for Appearances’ (1855). In 1851 appeared the first volume of his most important work, ‘London Labor and the London Poor.’ He was one of the founders of ‘Punch’ (1841) and its first editor. Other works of his are: ‘The Wonders of Science, or Young Humphry Davy’; ‘Young Benjamin Franklin’; ‘The Boyhood of Martin Luther’; ‘German Life and Manners, as Seen in Saxony at the Present Day’; ‘The Criminal Prisons of London and Scenes of Prison Life’ with Binny. His brothers Horace, Thomas, and Edward also assisted Henry and Augustus in their enterprises, beside publishing independently.

Mayhew, Jonathan, American clergyman: b. Martha’s Vineyard, Mass., 8 Oct. 1720; d. Boston 9 July 1766. He was graduated from Harvard in 1744, and from 1747 until his death was minister of the West Church in Boston. In a day of theological controversy, he was prominent for his tracts. His views were so liberal as to exclude him from the Boston Association of Congregational Ministers. He opposed the measures of the British society for the propagation of the Gospel in foreign parts, and got into a dispute about it with Secker, archbishop of Canterbury. In both pulpit and press he was an earnest patriot, being of much assistance to Otis and other early leaders. Among his writings are: ‘Seven Sermons’ (1749); ‘Discourse concerning Unlimited Submission and Non-resistance to the Higher Powers’ (1750); and ‘Sermons’ (1756). Consult: The ‘Memoir’ by Bradford (1838); Tyler, ‘History of American Literature.’

Mayhew, Thomas, American colonial governor: b. England 1592; d. Martha’s Vineyard, Mass., March 1682. Prior to his emigration to New England he had been a merchant in Southampton. He settled first at Watertown, Mass., and in 1641 secured from the agent of Lord Stirling a grant of the larger part of the island of Martha’s Vineyard and the title of governor. With his son Thomas he labored to convert the Indians of the island, so successfully that during King Philip’s War the island Indians protected the white settlers. He founded Edgartown in 1647, and after the death of his son and grandson continued their ministry and organized an Indian church.

Maynard, mā’nard, **Charles Johnson,** American naturalist: b. West Newton, Mass., 6 May 1845. He had a common school education, worked on a farm, and devoted himself to natural history as a boy. He is well known as an ornithologist, discovered the bittern’s vocal organs, and in 1875 was elected vice-president of the Nuttall Ornithological Club, in connection with which he founded and edited ‘The Nuttall Bulletin.’ As a conchologist he studied the genus *Cerion* of West Indian shells. He also made important additions to the knowledge of American butterflies. Maynard wrote: ‘Naturalists’ Guide’; ‘Butterflies of New England’; ‘Eggs of North American Birds’; ‘Contributions to Science’; ‘Manual of North American Butterflies’; ‘Sparrows and Finches of New England;’ ‘Sponges’; ‘Warblers of New England’; ‘The Genus *Strophia*’; and ‘Manual of Taxidermy.’

Maynard, Edward, American inventor: b. Madison, N. J., 26 April 1813; d. Washington, D. C., 4 May 1891. He entered West Point in 1831; resigned because of ill-health in 1832; studied dentistry; and practised in Washington from 1836 to 1890. He invented new dental tools; discovered in 1846 the diversity of the maxillary antra; introduced the method of filling cavities with gold foil; taught dentistry in the Baltimore College of Dental Surgery and in the National University at Washington; and practised successfully in Europe. His great fame was due to his invention of small arms and new priming methods which superseded percussion caps. He patented a breech-loading rifle in 1851; a method of converting muzzle-loaders to breech-loaders in 1860; a plan to join two barrels so that contraction and expansion in either would be independent of the other, in 1868; and in 1886 a registering device showing the number of cartridges in a magazine rifle. His rifle was adopted by the United States, and brought him decorations from the governments of Belgium, Prussia, and Sweden.

Maynard, George Willoughby, American artist, son of Edward Maynard (q.v.): b. Washington, D. C., 5 March 1843. He studied art in the Royal Academy of Antwerp; worked in Paris in 1878; then returned to America, where he received a medal from the Pennsylvania Academy of Fine Arts in 1884, and was elected to the National Academy in 1885. He was president of the Salmagundi Sketch Club and of the American Black-and-White Society. Besides his portraits, Maynard’s most important canvases are: ‘Vespers at Antwerp’; ‘1776’; ‘Water Carriers of Venice’; ‘A Musician’; ‘Bachelor’s Breakfast’; ‘Ancient Mariner’; ‘Old and Rare’; ‘Strange Gods’; and ‘Grandfatherly Advice.’

Maynard, Horace, American politician: b. Westboro, Mass., 30 Aug. 1815; d. Knoxville, Tenn., 3 May 1882. He was graduated from Amherst College in 1838; and became instructor, and later professor, in East Tennessee College, Knoxville, Tenn. He studied law, was admitted to the bar in 1844, and built up a successful practice. In 1857 he was nominated for member of Congress by the Know-Nothing party, and elected. On the outbreak of the Civil War he declared his loyalty to the Union and took an active part in the unsuccessful attempt to keep Tennessee from seceding; on this account he suffered persecution and heavy loss of property during the War. In 1866–75 he was again member of Congress, being representative-at-large for his State in the last two years. In 1875 he was appointed minister to Turkey, and, in 1880 postmaster-general in President Hayes’ cabinet, holding the office till 4 March 1881.

Maynooth, mā-nooth’, Ireland, a market-town of County Kildare, 13 miles by rail north-west of Dublin. Its modern celebrity is derived from the well-known Roman Catholic college of Saint Patrick (q.v.). Maynooth is of historic interest as the seat of the powerful Geraldines, and has ruins of their castle, built 1176 and enlarged in 1426. Several battles with the English occurred here, including the rebellion of Silken Thomas in the reign of Henry VIII., and the war of the Confederates (1641–50). Pop. under 1,000.

Maynooth College. See SAINT PATRICK'S COLLEGE.

Mayo, mā'ō, **Amory Dwight,** American Unitarian clergyman and educator: b. Warwick, Franklin County, Mass., 31 Jan. 1823; d. 8 April 1907. He was graduated from Amherst, and taught in the public schools in Massachusetts 1839–44. In 1846 he became the minister of the Universalist Church at Gloucester, Mass., and later held Universalist pastorates at Cleveland, Ohio (1854–6), and at Albany, N. Y. (1856–63). He then entered the Unitarian ministry, and was pastor at Cincinnati, Ohio (1863–72), and at Springfield, Mass. (1872–80). He was long prominent as an educator, was an efficient and active member of the boards of education in Cincinnati and Springfield, and was connected with the Meadville (Pa.) Theological School as lecturer and professor from 1868–98. After 1880 he devoted his attention chiefly to the advancement of education in the South, lecturing frequently in many different States. He was the chief editorial writer for the 'New England and National Journal of Education,' and published 'The Moral Argument for Universalism'; 'Graces and Powers of the Christian Life' (1852); 'Biography and Collected Writings of Mrs. S. C. E. Mayo'; 'Symbols of the Capitol, of Civilization in New York' (1859); 'Talks with Teachers' (1885); 'Southern Women in the Recent Educational Movement in the South' (1892); and 'History of the American Common School.'

Mayo, Frank, American actor: b. Boston 19 April 1839; d. 8 June 1896. His first appearance on the stage was at the American Theatre in San Francisco, and he was for several years the leading actor on the Pacific coast. In August 1865 he appeared in Boston as Badger in 'The Streets of New York' with great success, and though he played Shakespearian and other roles acceptably, became best known in his character of Davy Crockett, first played by him in Rochester, N. Y., in 1872, and thereafter almost exclusively by him till 1884. In later years he played in his own drama of 'Nordeck' and in a stage version of 'Pudd'nhead Wilson.'

Mayo, Isabella Fyvie, "EDWARD GARRETT," English novelist: b. London 10 Dec. 1843. She is of Scottish parentage, and was married to J. R. Mayo, a solicitor, in 1870. Since his death, in 1877, she has resided in Aberdeen. Among her works are: 'Occupations of a Retired Life' (1868); 'Friends and Acquaintances' (2d ed. 1872); 'By Still Waters' (new ed. 1886); 'The Capel Girls' (new ed. 1877); 'The House by the Works' (new ed. 1881); 'Equal to the Occasion' (1887); 'A Daughter of the Klephts' (1897); 'Chrystal Joyce' (1899). Her stories, many of which are semi-religious in cast, have been much read in this country.

Mayo, mī'ō, a tribe of Mexican Indians of the Pinan family, located on the banks of the Mayo River in southern Sonora. Their allies and northern neighbors are the Yaquis (q.v.), and their habits and language are almost identical. They are a peaceful, agricultural people and are thoroughly Mexicanized. They number perhaps 6,000.

Mayo-Smith, mā'ō-smĭth', **Richmond,** American political economist: b. Troy, Ohio, 9 Feb. 1854; d. New York city 11 Nov. 1901. He was graduated from Amherst College in 1875, and studied in Germany for two years. From 1877 he was connected with Columbia University, first as assistant in history and political science, then as adjunct professor (1878–83), and professor of political economy and social science (1883–1901). He was also one of the faculty of the graduate School of Political Science, established in 1880, and his chief work as teacher was done in this school. His specialty was statistics, on which he was a recognized authority. He was an honorary fellow of the Royal Statistical Society of Great Britain, a member of the International Statistical Institution and of the American Statistical Association, being vice-president of the latter; he was also a member of the National Academy of Science, and of the American Economic Association, of which he was one of the founders. He was editor of the 'Political Science Quarterly' from 1886, and published 'Emigration and Immigration' (1890); 'Statistics and Sociology' (1895); and 'Statistics and Economics' (1899).

Mayon, mā-yōn', a volcano of the Philippines situated in the northern part of the province of Albay, Luzon, height 8,274 feet. It rises from a broad plain about six miles from Albay Gulf, and forms a perfect cone; its summit is surrounded by vapor, which at night has a fiery glow. Its sides, almost to the top, are covered with grass or moss, and the ascent though it has been made, is difficult. Near the summit there are fissures which emit sulphurous gases and steam, and there were several eruptions during the 19th century, the town of Cagsaua at the foot of the mountain being entirely destroyed in 1814.

Mayonnaise, mā-ŏn-āz', a thick cold dressing for salads, cold meat, poultry, fish, vegetables, etc., made of the yolks of eggs, salad oil, and vinegar, with a little salt and pepper; it is sometimes colored red with powdered lobster shell, or green with spinach or parsley.

Mayor des Planches, mä'yōr dā plänch'āz, **Edmondo,** Italian ambassador to the United States: b. 27 July 1851. He was graduated from the University of Turin in 1874 and entered the diplomatic service the next year. He was secretary to the prime minister Depretis 1876–8, and was Crispi's chief of cabinet 1887–1901. He was minister at Belgrade 1898–1901 and since the last named date has been ambassador to this country. He has published 'La Signora di Kruedner' (1881); 'Crispi chez Bismarck' (1894); 'Nuove Lettere del Conte di Cavour' (1895); etc.

Mayor. See MUNICIPAL GOVERNMENT.

Mayotta, mä-yŏt'tä, or **Mayotte,** mä-yŏt'. See COMORO ISLANDS.

Mayow, mā'ō, or **Mayo, John,** English physiologist and chemist, the first to attack the theory of phlogiston: b. London May 1643; d. there October 1679. He was of a Cornish family; entered Wadham College, Oxford, in 1658; became a scholar there in 1659; and was elected a fellow of All Souls in 1660. He was graduated in 1665; studied medicine; practised in Bath; and in 1678 was elected to the Royal Society. His Latin tract on the Respiration appeared in 1668; it urged that the heart was a mere muscle, that breathing is simply to give the nitroaerian constituent (oxygen) to the blood, and that this constituent is necessary to life. In 1674 he published 'Tractatus Quinque,' summarizing and completing his theory; in this work he showed that «fire-air,» «nitre air» or «aerial spirit,» as he styled oxygen, is contained in all acids and is necessary to combustion and respiration, which are therefore analogous.

Mayoyaos, mä-yō-yä'ō, a native tribe of the island of Luzon, Philippines, living in the southwestern part of the province of Isabela and in the northwestern angle of the province of Nueva Vizcaya. They are a head-hunting tribe of Malay race; and of the Ifugao linguistic stock.

Maysville, māz'vĭl, Ky., city, county-seat of Mason County; on the Ohio River, and on the Louisville & N. and the Chesapeake & O. R.R.'s; about 63 miles southeast of Cincinnati. The first settlement was made about 1782, and in 1787 it was incorporated by the legislature of Virginia. In 1833 it was granted a city charter. It is in a rich agricultural region, and its facilities for transportation give it considerable commercial importance. Its chief manufacturing establishments are flour and lumber mills, foundries, distilleries, cotton mills, plow and pulley works, boot and shoe factories, tobacco, and furniture. Some of the prominent buildings are the Masonic Temple, the Odd Fellows' Temple, and the Maysville and Mason County Public Library. The library organization was established in 1878. The government of the city is vested in a mayor, who holds office four years, and a council. Pop. (1910) 6,141.

Mazarin, măz'ạ-rĭn (Fr. mä-zä-răṅ), **Jules,** or **Giulio Mazarini,** mäd-zär-ē'nē, French cardinal and minister of Louis XIV.: b. Piscina, in the Abruzzi, Italy, 14 July 1602; d. Vincennes, 9 March 1661. He was educated at Rome by the Jesuits, thence proceeded to the University of Alcala in Spain; entered the pope's military service, and distinguished himself by diplomatic ability, for which he was rewarded with two canonries, and the appointment of nuncio to the court of France (1634–6). Here he gained the favor of Richelieu; accepted service from the king, and became a naturalized citizen of France; was made a cardinal in recognition of his diplomatic services in Savoy; and in 1642, when Richelieu died, promptly succeeded him. On the death of Louis XIII. the queen, Anne of Austria, became regent for her young son, Louis XIV., and it was thought that Mazarin would be dismissed; but instead he gained over the queen-regent, and made himself master of the nation. Two parties in the state rebelled against this usurpation of supreme power by the cardinal. The Parliament of Paris denounced his increasing taxation, while the nobility dreaded his supremacy, and the combination of these malcontents resulted in the civil war of the Fronde (q.v.). As the immediate result of the conflict, Mazarin had twice to leave the court, but through means of intrigue formed a powerful royal party in the state, gained General Turenne to his cause, and finally returned to his position at court in 1653. During the succeeding eight years he remained all-powerful in France; pursued the policy of Richelieu in foreign affairs; made an alliance with Cromwell; brought the Rhine provinces under the headship of France, and in the treaty of the Pyrenees humiliated Spain, and gained much of French Flanders. In proportion as his foreign policy was successful, his home policy was disastrous. He did nothing for the people but increase their taxes to fill an impoverished exchequer, though he secured the supremacy of the crown over the feudal lords. Consult: Chéruel, 'France sous le Ministère de Mazarin' (1881–2); Mason, 'Mazarin' (1886); Perkins, 'France under Mazarin' (1894).

Mazatlan, mä-sät-län', Mexico, a town and seaport about 183 miles southeast of Sinaloa, at the entrance to the Gulf of California. It is built on a hilly crest and has a pleasing appearance. Mazatlan is the chief Pacific port of Mexico, and the outlet for the products of the mining district of Saint Sebastian; it has a considerable import trade.

Mazdak, mäz'däk, Persian religious leader: b. Persepolis about 470 A.D.; d. Nahrvan between 530 and 540. He was a chief priest at Nishapur, and in 500 proclaimed himself a prophet. He converted King Kobad to his views, which forthwith became law. Khosru Nashirvan put him to death.

Maze, Hippolyte, ē-pō-lēt mäz, French historian: b. Arras 5 Nov. 1839; d. Paris 25 Oct. 1891. He studied at the École Normale Supérieure; taught there and at the Lycée Fontanes; was elected prefect of Landes in 1870, deputy in 1879 and 1881, and senator in 1886; and wrote: 'The Republic of the United States: Its Foundation' (1869); 'Hoche in Vendée' (1882); 'The Struggle against Want' (1883); 'General Marceau' (1889); and 'The Generals of the Republic' (1889).

Mazeppa, mä-zĕp'ä, **Ivan Stephanovitch,** or **John,** hetman of the Cossacks: b. Podolia about 1645; d. Bender, Bessarabia, 1710. He was page to John Casimir, who was a patron of the arts and of literature, and he had therefore an opportunity of acquiring various useful accomplishments. A Polish nobleman having surprised Mazeppa with his wife, bound him naked upon his own horse, and committed him to his fate. The horse carried him to his own residence. Shame made him flee to the Ukraine and join the Cossacks, whose warlike roving life suited his disposition. He made himself conspicuous by his dexterity, bodily strength, and courage. His knowledge and sagacity procured him the post of secretary to the hetman Samilovitch, and in 1689 he overthrew Samilovitch, and himself became hetman. He gained the confidence of Peter the Great, who loaded him with honors, and he was finally made Prince of the Ukraine. In 1706 he opened negotiations with Charles XII. (q.v.) of Sweden for the purpose of freeing himself from Russian dominion, but his treachery was finally revealed to Peter, and he was obliged openly to declare for Charles. After the defeat of Pultowa, Mazeppa fled to Bender. Lord Byron has made Mazeppa the hero of a poem (1818).

Mazur'ka, a lively Polish national dance, popular also in the United States. The movements are of a grotesque character. The term is also applied to the music which accompanies the dance, sometimes in 3/8 time, but for the most part in 3/4. The mazurka is danced by four or eight couples.

Mazzini, Giuseppe, Italian patriot: b. Genoa 28 June 1808; d. Pisa 10 March 1872. He studied law at the University of Genoa, and practised his profession for a time, but he was soon drawn into a political career by his republican sentiments, and the condition of Italy under Austrian rule. His first political essays appeared under the mask of literary critiques in the ‘Indicatore Genovese,’ which was suppressed when the radicalism of his sentiments was discovered, and revived as the ‘Indicatore Livornese,’ to be in its turn also soon suppressed. He was an active member of the Carbonari, and while on a mission for that society was arrested and imprisoned for a short time; on his release he went to Marseilles, France, to escape the police surveillance imposed on him in Italy. Here he organized the society known as Young Italy, and established a journal to advocate his views; the purpose of the society was to liberate Italy and establish a national government, Mazzini desiring a republic. He took active part in the organization of an insurrection of which Genoa was to be the centre, but the plot was discovered and failed, and he was sentenced to death. He then went to Switzerland, where he organized another conspiracy for the invasion of Savoy (1834), which also failed. In 1836 he was banished from Switzerland and went to London, where he kept in correspondence with the revolutionary leaders on the Continent, was recognized as the head of the Young Italy party, and instigated several insurrections which were unsuccessful. After the insurrection in Milan in 1848, he again went to Italy, was chosen a member of the provisional government in Tuscany; and in 1849 when Rome was proclaimed a republic became the first of the triumvirs; in June the city was surrendered to the French, and Mazzini escaped to Switzerland and then to London. Later he had a hand in the unsuccessful uprisings at Mantua (1852), in Milan (1853), and in Piedmont (1857), being in Italy for a short time in 1857. He assisted also in organizing the expeditions led by Garibaldi in 1860, 1862 and 1867. An ardent republican, he refused to take his seat in the Italian parliament under the monarchy, though elected from Messina in 1865, as a protest against the uncanceled death sentence against him. In 1866 this sentence was formally rescinded; in 1870 he was arrested under charge of conspiracy with Garibaldi, and imprisoned for two months. Though his actions were sometimes politically indiscreet, he was a man of attractive character and strong personal magnetism, distinguished throughout his career for disinterested patriotism and the highest moral standards of conduct. He was interested in the labor movement, organized a workingmen's association in London in 1840, and was for a time connected with the International Workingmen's Association (q.v.), but withdrew from that society when it declared for socialism. During his later life especially his efforts were directed toward separating republicanism from both socialism and atheism. The best edition of his works is ‘Seritti Editi ed Inediti’ (1861–74); a partial collection is published under the title ‘Life and Writings of Joseph Mazzini’ (1891). Consult: ‘Memoir of Joseph Mazzini’ (1877), containing his two essays, ‘Thoughts on Democracy in Europe’ and ‘On the Duties of Man’; Linton, ‘Recollections of Mazzini’ (1892); Marriott, ‘Makers of Modern Italy’ (1889); and Thayer, ‘The Dawn of Italian Independence’ (1893); Martinengo-Cesaresco, ‘Italian Characters.’

Mazzola, mät-sō'lä, or **Mazzuoli,** mät-soo-ō'lä, **Francesco,** Italian painter, known from his birthplace as Il Parmigiano: b. Parma 11 Jan. 1503; d. Casal Maggiore 24 Aug. 1540. His father and two uncles were painters, and to them and to Correggio, who was in Parma in 1521, he owed his earlier training. Correggio's manner he caught so well that his ‘Cupid Fashioning a Bow’ was long and generally attributed to Correggio. When 20 he went to Rome and there imitated Raphael and Michelangelo. In 1527, upon the capture of Rome by Charles V., his losses were great and he had to escape from the city. He returned to Parma, lost his health, was imprisoned by the city authorities for failure to complete a commission which had been paid for in advance, and upon his release fled to Casal Maggiore, failing to live up to his promise to repay. His paintings are to be found in most of the galleries of Europe; mention should be made of the ‘Madonna with St. Margaret,’ in the Bologna Gallery; ‘Madonna del Collo Lungo,’ Pitti Palace, Florence; ‘Annunciation,’ Ambrosian Library, Milan; various portraits in the Naples Museum; several sacred subjects, notably ‘Madonne’ in the Dresden Gallery and in the Louvre; and the great frescoes in the Church of St. John, Parma. More important, though less well known, are Mazzola's etchings, since he introduced etching into Italy. His drawing is correct, and his work bold, fiery and graceful.

Mazzoni, Guido, gwē'dō mat-sō'nē, Italian scholar: b. Florence 12 June 1859. He was educated at Florence, Leghorn, and Bologna, in 1881 became instructor in Italian literature in secondary schools, and in 1887 professor of Italian literature at Padua. His poetic work has been to some extent influenced by his familiarity with English literature and largely by his countryman Carducci. Besides contributions to reviews, he wrote: ‘Epigrammi di Meleagro da Cadora’ (1880); ‘In Biblioteca’ (1882); ‘Esperimenti metrici’ (1882); ‘Un Ritratto di Gesū’ (1887); ‘Rassegne litterarie’ (1887); ‘Fra Libri et Carte’ (1887); and other works.

Mead, mēd, **Charles Marsh,** American Congregational clergyman: b. Cornwall, Vt., 28 Jan. 1836. He was graduated from the Andover Theological Seminary in 1862, studied in Germany and was ordained to the ministry in 1866. From 1866–82 he was professor of Hebrew at Andover, and for the succeeding 10 years lived in Germany as a member of the American Bible Revision Committee. He returned to the United States in 1892 and until 1898 was professor of theology at Hartford Theological Seminary. He has published: ‘The Soul Here and Hereafter’ (1879); ‘Romans Dissected’ (1891); ‘Christ and Criticism’ (1893); etc.

Mead, Edwin Doak, American author and lecturer: b. Chesterfield, N. H., 29 Sept. 1849. His early life was spent on his father's farm, and in 1866 he entered a publishing house in Boston. He studied in English and German universities 1875–9, and has since engaged in lecturing and writing. In 1889 he was associate editor of the 'New England Magazine' with Edward Everett Hale, and chief editor 1890-1901. He is connected with numerous historical and social clubs, and has written: 'The Philosophy of Carlyle' (1881); 'Martin Luther — a Study of Reformation' (1884); 'A More Beautiful Public Life' (1894); etc.

Mead, Larkin Goldsmith, American sculptor: b. Chesterfield, N. H., 3 Jan. 1835; d. 15 Oct. 1910. He was educated in the public schools and studied art in Italy, where in Venice he was a member of the United States consulate. His first work was an ideal figure, 'The Recording Angel,' executed in 1855. He served for a time in the Civil War as illustrator for 'Harper's Weekly,' and after the war his work as a sculptor gave him national prominence. The statue of Lincoln on the monument at Springfield, Ill., is his work, as are the bronze statues of Ethan Allen at the Capitol in Washington and in Montpelier, Vt. His work includes many ideal pieces: 'The Returned Soldier'; 'The Return of Proserpine from the Realm of Pluto' (exhibited at the World's Columbian Exposition); etc.

Mead, Lucia Ames, American author: b. Boscawen, N. H., 5 May 1856. She is a lecturer and writer on social and economic questions, an advocate of advanced movements generally including woman's suffrage. She was married in 1898 to Edwin D. Mead (q.v.), is prominently connected with various clubs and has written: 'Memoirs of a Millionaire' (1890); 'To Whom Much is Given' (1898); 'Milton's England' (1902); etc.

Mead, William Rutherford, American architect: b. Brattleboro, Vt., 20 Aug. 1846. He was graduated from Amherst College in 1867, studied architecture in New York and Europe, and upon his return to the United States became a member of the prominent New York firm of McKim, Mead and White, which has had charge of many of the most important public and private buildings in the country. He is a brother of L. G. Mead (q.v.).

Mead, or **Meth,** a vinous liquor, used in northern Europe and made of honey and water by means of digestion and fermentation. It also receives an addition of fruit, spices and simples to give it a richer flavor. When new, mead has always a strong taste of honey, but this diminishes as it becomes older. Mead is mixed with the must of apples, or with wine, beer, and even vinegar, and then takes the name of wine-mead, beer-mead, etc.

Meade, mēd, **Elizabeth Thomasina,** English novelist: b. Bandon, County Cork. Her literary career began at 17, and later she went to London, where she was employed in the British Museum. She was married in 1879 to Alfred Toulminsmith, but continued her literary work, and for six years edited 'Atalanta,' a magazine for young people. Among her books are: 'Scamp and I'; 'The Way of a Woman'; 'The Cleverest Woman in London' (1898); 'Drift'; 'All Sorts'; etc.

Meade, George Gordon, American soldier: b. Cadiz, Spain, 31 Dec. 1815; d. Philadelphia 6 Nov. 1872. In 1835 he was graduated from the United States Military Academy and assigned to the 3d artillery, in 1835-6 served in the Seminole war in Florida, on 26 Oct. 1836 resigned from the army, and in 1836-7 was assistant engineer in the construction of the Alabama, Florida and Georgia railway. He was later employed in various works of engineering, including surveys of the mouths of the Mississippi and of the northeast boundary between the United States and British North America. On 19 May 1842 re-entered the army as 2d lieutenant of topographical engineers. He joined Scott's staff at Corpus Christi, Tex., 14 Sept. 1845, and during the Mexican War participated in the battles of Palo Alto, Monterey, and Resaca de la Palma, and the siege of Vera Cruz. After the war he was occupied in lighthouse construction and in the geodetic survey of the Great Lakes (1857-61). He became captain in the corps of engineers in 1856. On 31 Aug. 1861 he was commissioned brigadier-general of volunteers, and assigned to the command of the 2d brigade of the Pennsylvania reserve corps of the army of the Potomac, stationed on the right of the lines before Washington. He served in the Virginia peninsula campaign, and took part in the actions at Mechanicsville (26 June), Gaines' Mill (27 June), and Frayser's Farm (30 June). On 18 June he was promoted major of engineers. At Manassas (second Bull Run), he commanded the 1st brigade of Reynold's division; and later he took a distinguished part at South Mountain (14 Sept.) and Antietam (17 Sept.). In the latter battle, when Hooker was wounded, he was placed in command of the First corps. For his services he was promoted major-general of volunteers 29 Nov. 1862; and at Fredericksburg (13 Dec.) commanded the 3d division of the First corps, with which he broke through Lee's right and penetrated to the position occupied by the Confederate reserves, but for want of support was compelled to fall back. At Chancellorsville (2-4 May 1863) he commanded the Fifth corps. On 28 June 1863 he was appointed commander of the army of the Potomac, to succeed Hooker. His command was then scattered, and on the march through Pennsylvania in pursuit of the Confederate invaders. Meade had everything yet to learn of both his own force and the enemy. At Gettysburg on 1-3 July he won the great and decisive battle with which his name is generally associated. (See Gettysburg, Battle of.) He received the thanks of Congress and was made brigadier-general, U. S. A., 3 July 1863. During the remainder of the war he commanded the army of the Potomac with conspicuous ability, and on 18 Aug. 1864 became major-general in the regular army. From 1 July 1865 until his death he was commander of the military division of the Atlantic, with the exception of the period January 1868-March 1869, when he was in command successively of the third military district and the department of the South. He was a fellow of the American Academy of Arts and Sciences. There is an equestrian statue of him by Calden in Fairmount Park, Philadelphia, and one by Bush-Brown on the field of Gettysburg. Consult: Bache, 'Life of General G. G. Meade' (1897); Pennypacker, 'General Meade' (1901).

Meade, L. T. See Meade, Elizabeth Thomasina.

Meade, Richard Kidder, American soldier: b. Nansemond County, Va., 14 July 1746; d.

Frederic, now Clarke County, after 1800. He was educated in England at Harrow and in private schools. He had returned from England some years before the outbreak of the Revolution, and in 1775 entered the service of the struggling colonies, and distinguished himself in his first battle, that at Great Bridge. Recognition came speedily with an appointment to the staff of General Washington, with whom he remained until the close of the war. The supervision of the execution of Major André fell to his lot, a duty which while recognizing the necessity for it, he performed with deep regret. At the conclusion of the war he returned to Virginia to engage in the quiet life of the plantation.

Meade, Richard Worsam, American naval officer: b. New York 9 Oct. 1837; d. Washington, D. C., 4 May 1897. He was a nephew of General G. G. Meade (q.v.). He entered the navy as midshipman 2 Oct. 1850. His promotions were: lieutenant 23 Jan. 1858; lieutenant-commander 16 July 1862; commander 20 Sept. 1868; captain 13 March 1880; commodore 5 May 1892; and rear-admiral 7 Sept. 1894. On 20 May 1895 he was retired from the service. He was naval representative of the United States at the World's Columbian Exposition, Chicago, 1893. He published 'A Treatise on Naval Architecture and Ship-building' (1869).

Meade, William, American Protestant Episcopal bishop: b. near Millwood, Va., 11 Nov. 1789; d. Richmond, Va., 14 March 1862. He was a son of R. K. Meade (q.v.), and was graduated from Princeton College in 1808, studied theology, and took orders in the Episcopal ministry in 1811. His first charge was his home parish, which he served gratuitously, and in 1829 he was elected assistant to Bishop Moore. He was in charge of Christ Church in Norfolk, Va., in 1834-6, and in 1841 succeeded Bishop Moore as head of the diocese of Virginia. He was one of the founders in 1847 of the 'Evangelical Knowledge Society' and was the author of several works, among which are: 'Family Prayers' (1834); 'Reasons for Loving the Episcopal Church' (1852); 'The Bible and the Classics' (1861).

Meadow, Making and Care of. Meadows may be divided into general groups which will depend upon location, duration, and purpose, and their treatment will vary with each of these factors. Meadows located upon low ground, which may be inundated, or which is constantly moist, usually consist of grasses and other plants which do not thrive so well upon upland fields. Because of their dampness they cannot be treated like dry soils, and they are therefore more frequently permanent than temporary. Further, they are generally better adapted for haying than for grazing, because the grasses that naturally grow upon them are ranker, taller growing species and generally have grown to a considerable height before the land becomes dry enough to turn stock upon it. Except as to season the preparation of lowland meadows is not necessarily different from that of upland.

For best results the land should be deeply plowed as early in the season as soil conditions will permit, and harrowed at intervals of 10 days and after each rain that forms a crust until late summer. The practice will not only destroy weeds and weed seeds, but insure the quick germination of grass seed sown even in dry weather, the soil being moist close to the surface. The soil may be anything, but preferably not sand or clay. If mucky, as in a reclaimed swamp, rolling is frequently advisable, otherwise generally not. Prior to plowing liberal applications of good manure or commercial fertilizers should be made and light annual dressings should also be given, preferably in autumn or early spring. Temporary pastures which are intended to last only three or four years should constitute part of a general rotation scheme (see ROTATION OF CROPS) and should be followed by some crop such as corn or potatoes, which can best utilize their products of decomposition. Permanent meadows should be inspected each spring and the spots which appear to be failing given special attention, such as fertilizing, liming, seeding, etc., to maintain a general good average. When the annual yield of hay falls below two tons the meadow may be considered unprofitable and should be plowed up and given a change of crop for three or four years.

In general, timothy or «herd's-grass» is the most popular grass in America, because it is hardy, long-lived, large, easily cured, and its seed inexpensive and likely to be free from weed seed. Orchard grass, tall meadow fescue, red-top, rye-grass and cat-grass are also often used, but are secondary. Blue-grass, which generally appears as a volunteer grass in permanent meadows, is rarely profitable as a hay grass, but is unequaled in the North as a pasture grass. These grasses may all be sown with a sparsely planted cereal which acts as a «nurse crop.» But this practice is generally considered inexpedient. The admixture of clover, however, is generally highly desirable, since the clovers supply nitrogenous food to the grasses. Alsike clover is considered best for mixing with timothy since it is somewhat later in ripening than the other large clovers, which mature before the timothy can be profitably cut.

Meadow-beauty. See DEER-GRASS.

Meadow Fescue, a fescue-grass (*Festuca*). See GRASSES IN THE UNITED STATES.

Meadow Grass. See BLUE GRASS.

Meadow-hen, the American coot. See COOT.

Meadow-lark, or **Medlark,** a beautiful American starling (*Sturnella magna*), numerous in eastern United States as far west as the high central plains, where it is replaced by a variety (*neglecta*) remarkably different in song and some habits. It is about 11 inches long, and the tail 5 inches. The body is thick and stout, the legs large, the bill long and straight, and the flight powerful. The upper parts are brown, marked with brownish-white, and the exposed portions of the wings and tail with transverse dark-brown bars; the under parts yellow, with a black crescent upon the breast, which is very distinctive as well as a handsome ornament. These birds receive their popular name «lark» from their terrestrial habits and way of singing in the air, uttering a loud sweet double call while circling upon fluttering wings above the meadow or grain-field where the nest is carefully concealed among the roots of the grasses. The eggs are white, profusely speckled with light red. The western variety has a longer, more vivacious and tuneful song than the eastern bird, and is justly accounted the finest songster of the open regions of the interior. These birds are migratory in the northern parts of their range, but most of them remain during the winter in the middle parts of the United States and southward, and in the autumn are often shot for market. In the Southern States it is commonly called «old-field lark.»

Meadow-mouse. See FIELD-MICE.

Meadow-pink, or **Meadow-campion,** the common cuckoo-flower (q.v.), or ragged robin (*Lychnis flos-cuculi*). See LYCHNIS.

Meadow-rue, a plant of the crowfoot family and of the genus *Thalictrum*. These rues are erect perennial herbs, with small deeply cut leaves, and pretty flowers, usually in loose panicles. The genus contains about 75 species, scattered about the north temperate zone, of which the United States and Canada possess about 15 species, some of which are well-known. The early meadow-rue (*T. dioicum*) is a slender, leafy species, of rocky woods, a foot or two in height, whose flowers, purplish and greenish with yellowish antlers, appear in April or May. The purple meadow-rue (*T. purpurascens*), common in New England woods, is distinguishable by its size (2 to 4 feet tall), large, bright-green, waxy leaves and purplish stem; the flowers form a greenish fleecy bloom. A third large species is the thick-leaved (*T. coriaceum*) of the Southern States, whose flowers are of different hues, the staminate flowers being white and showy, while the pistillate flowers, borne on separate plants, are purplish. The tall meadow-rue (*T. polygonum*), towers to a height of 12 feet in favorable situations. All are fertilized mainly by the wind.

Meadow-snipe. See JACK-SNIPES.

Meadowsweet, a well-known handsome European plant (*Spiræa ulmaria*) of the rose family. It grows by the sides of streams and in damp places, has pinnate leaves, and stems two feet high bearing corymbs of white fragrant flowers. A decoction of it with copperas is used for dyeing black, and the root has been used as a tonic. It is also called queen of the meadow.

Meadville, mĕd'vĭl, **Pa., city, county-seat of Crawford County;** on French Creek, and on the Erie and a branch of the Pittsburg, B. & L. E. R.R.'s; about 90 miles north of Pittsburg and 30 miles south of Erie. The first settlement was made in May 1788 by David Mead and others. It became a borough in 1823, and in 1866 was chartered as a city. It is in a fertile agricultural region, in the vicinity of extensive oil fields, and in the part of the State noted for its iron and steel industries. The chief manufacturing establishments are the Erie railroad shops, with nearly 2,000 employees; the Phœnix iron works, and the Meadville malleable iron works, with 500 employees; the Keystone vise works, with 250 employees; chocolate chips factory, with 150 employees; Barbour silk mills, 120 employees; shoe-button fastener works, silk mills, printing works, confectionery factories, engine works, and other manufactories employing over 500 persons. The city has 20 churches, an academy of music, court-house, three parks, the county fair ground, a race track, three iron bridges, and several fine wholesale and retail buildings Its educational institutions are the public and parish schools, a high school, the Meadville Theological School, opened in 1844 by the Unitarians; Allegheny College, opened in 1815 by the Methodist Episcopals; Pennsylvania College of Music, Meadville Business College, and a public library. There are the City Hospital and Saint Joseph's Hospital. The three banks have a combined capital of $350,000. The government is vested in a mayor, who holds office three years, and a council. The charter of 1889 is in accordance with the general State law for establishment of cities. The electric-light plant and the waterworks are owned and operated by the city. Pop. (1910) 12,780. WALTER IRVING BATES,

Editor of 'Tribune-Republican.'

Meagher, mä'hėr, **Thomas Francis,** Irish-American soldier: b. Waterford, Ireland, 3 Aug. 1823; d. near Fort Benton, Mont., 1 July 1867. He was educated at the Jesuit College, Clongowes Wood, Kildare, and at Stonyhurst College (near Preston), England; became one of the principal orators of the Young Ireland party, which aimed at independence through armed revolution; in 1848 was sent on a mission by the Irish Confederation to the French provisional government; and on 21 March was arrested on a charge of sedition. He was bailed, but on the passage of the treason-felony act re-arrested; and in October sentenced to death for treason. The sentence having been commuted to life banishment, he was removed to Tasmania (9 July 1849); but in 1852 escaped to the United States, where he was admitted to the bar in 1856 and practised in New York in 1856–61. In 1861 he organized a company of zouaves for the Federal army, with which he joined the 69th New York volunteers, under command of Colonel Michael Corcoran. After three months' service, he recruited the «Irish brigade» (1861–2), and was elected colonel of the 1st regiment. On 3 Feb. 1862 he became brigadier-general and took command of the brigade. He fought bravely at Richmond, the second Bull Run, Fredericksburg, and Antietam, and Fredericksburg, and after Chancellorsville found his command so reduced in numbers that he resigned. Early in 1864 he was reappointed brigadier-general of volunteers, and was assigned to the command of the military district of Etowah. He resigned 15 May 1865, was appointed secretary of Montana territory, and acted at one time as governor *pro tem.* He wrote 'Speeches on the Legislative Independence of Ireland' (1852). Consult: Cavanagh, 'Life, Writings and Speeches.'

Meagre. A fish. See MAIGRE.

Meakin, mē'kĭn, **Budgett,** English author and writer: b. Ealing Park, England, 8 Aug. 1866; d. London 26 June 1906. He was educated at the Reigate Grammar School, became associate editor of 'Times' of Morocco, and was editor 1884–93. He lectured extensively on industrial questions and on Oriental subjects. Among his works are: 'The Moorish Empire' (1899); 'The Land of the Moors' (1901); 'The Moors' (1902); 'Model Factories and Villages'; etc.

Meal-moth; Meal-worm. See FLOUR INSECTS.

Meal-tub Plot, in English history, an alleged conspiracy, concocted in 1679 by an informer, Dangerfield, with the view of cutting off those who were opposed to the succession of James II. after he had embraced Roman Catholicism. The false charges to which Dangerfield was prepared to swear were found in the meal-tub belonging to a Mrs. Cellier, one of his friends. Ultimately he confessed his crime, was whipped, and condemned to stand in the pillory.

Mealy-bug, a scaleless scale insect of the genus *Dactylopius* and family *Coccidæ*. These insects are covered with a mealy, or waxy substance which they secrete for protective purposes. Like their relatives, the true scale insects, they also secrete honey-dew and are attended and transported by ants; unlike these relatives they do not lose the power of locomotion. The species are most numerous in tropical and sub-tropical countries; one species (*D. citri*) being the best known outdoor species in the United States, feeding upon citrus trees in Florida. In greenhouses another species (*D. destructor*) is often troublesome. Owing to the protective covering difficulty has been met in ridding plants of these creatures, but fumigation and caustic solutions have been tried with most satisfactory results. See INSECTICIDE.

Mealy Wing, a minute bug of the family *Aleyrodidæ*, whose species (about 150 in number) have the wings covered with a white meal-like secretion. They are allied to the coccids, but differ in development and structural peculiarities; and throng upon the leaves of plants which they injure by sucking away the sap and also by attracting a growth of smut-fungus by their secretion of honey-dew. In this manner they blacken and harm orange and lemon trees in parts of Florida and Louisiana, where they are prevalent. Consult Howard, 'Insect Book' (1901).

Mean Value. If n quantities are commensurable, the sum of their units divided by n, the number of the quantities, is the *arithmetical mean* and is the *mean value* of the n quantities when their number is finite. For example, if the number of units in three quantities are respectively four, eight, and fifteen, the mean value is $\frac{4+8+15}{3} = 9$; and in general, if the number of units in n quantities is denoted by X_1, X_2, X_3, ... X_n, the mean value is

$$M = \frac{1}{n}(X_1 + X_2 + X_3 + \;.\;.\;.\;.\; + X_n).$$

But if a quantity vary continuously in accordance with some law, thereby assuming every possible value between two extremes, the number of different quantities is infinite, and the mean value in such a case requires a new definition. For example, assume that at every point in the diameter of a semicircle a perpendicular to the diameter is drawn to meet the semicircle. The lengths of these lines form a continuous series of values represented by every number from zero to r, where r is the length of the radius. In such a case if the n values of the perpendiculars are obtained and their sum is divided by n, the ratio would approximate to the mean value. But the limit of this ratio, as n is increased indefinitely, would be the mean value. It follows that the mean value will depend upon the law according to which the n values are selected. That is, the mean value of a continuously varying quantity is not definite until the law that governs the succession of values is known.

The several forms of the theorem that pass under the name of the mean value theorem involve the principles of the infinitesimal calculus. The *first theorem* of *the mean value* is the following: Let $f(x)$ denote any finite and continuous function of x in the interval between $x = x_0$ and $x = X$; let dx denote the increment and retain the same sign in this interval; and assume that m and M are respectively the least and the greatest values of $f(x)$ in this interval: then the definite integral $\int_{x_0}^{X} f(x)\,dx$ has a definite value that is greater than $m(X - x_0)$ and less than $M(X - x_0)$; that is:

$$m\int_{x_0}^{X} dx < \int_{x_0}^{X} f(x)\,dx < M\int_{x_0}^{X} dx.$$

Since $f(x)$ is continuous in the interval $X - x_0$, there must be a value $x = \xi$, where $x_0 < \xi < X$ such that $\int_{x_0}^{X} f(x)\,dx = (X - x_0)f(\xi)$, $m < f(\xi) < M$. The value, $f(\xi) = \frac{1}{X_0 - x}\int_{x_0}^{X} f(x)\,dx$, is called the *mean value* of $f(x)$ in the interval $X - x_0$. If we assume $F(x)$ to be the primitive or indefinite integral of $f(x)$, then $F(X) - F(x_0) = (X - x_0)f(\xi) = (X - x_0)F(\xi)$ which is the familiar form of the law of the mean in the differential calculus.

For the extensions of the mean value theorem due to Lagrange, Cauchy and Schlömilch and Roche, which lie at the basis of Taylor's theorem, see SERIES. Reference may be had to William's 'Integral Calculus' for further illustrations and extension of the theorem to include functions of two or more variables.

Meander, mē-ăn'dėr, in art, an ornamental design, in which the lines interlace; it is often used in decorating vases.

Means, mēnz, **David MacGregor**, American lawyer and author: b. Groton, Mass., 1 May 1847. He was graduated from Yale in 1868, studied theology at Andover and New Haven, was professor of economics in Middlebury (Vt.) College in 1877–80, and in 1881 was admitted to the bar and entered the practice of law. He contributed to periodicals, and wrote 'The Boss' (1894); and 'Industrial Freedom' (1897).

Means Grass. See GRASSES IN THE UNITED STATES.

Meares, mērz, **John**, English navigator: b. England 1756; d. London 1809. He entered upon a seafaring life at an early age and in 1776 he entered the navy and served in the war with the French until peace was declared in 1783, when he became a captain in the merchant service. In 1786 he explored the coast of Alaska and made in 1789 a second tour of exploration on the discoveries of which the British government based its claim to the possession of British Columbia and Oregon. He was the author of 'Voyages in the Years 1788–9, from China to the Northwest Coast of America' (1790).

Mearim River, Brazil, rises in the Serra do Negro, and after a northerly course of about 360 miles in the state of Maranham, flows into the Bay of São Marcos near the city of Maranham. It has numerous affluents, and is navigable, but the sudden tidal bores are dangerous.

Mears, Mary M., American author: b. Oshkosh, Wis., 2 Jan. 1871. She was educated at the State Normal School in Oshkosh and first became known to the reading public in 1896, when her work appeared in the magazines and speedily made her popular as a writer of short stories. She has traveled in Europe in search of literary materials and has published, under the pen-name «GEORGE MADDEN MARTIN,» ‹Emmy Lou — Her Book.›

Measles (also called RUBEOLA and MORBILLI), a communicable or infectious eruptive disease, one of the exanthemata, frequently epidemic, and sometimes dangerous because of its debilitating effects and tendency to end in inflammation of mucous membranes, such as pneumonia and enteritis. So-called black or malignant measles, occurring mostly in persons of very poor health, is usually fatal. Although measles is a disease of childhood, adults are not exempt from it. As a rule it attacks an individual but once. The contagious principle exists in the breath and in exhalations from the skin, the tears, the nasal and bronchial secretions, and the excretions. Clothing which has been in an infected atmosphere is liable to spread the disease. How long the contagium remains in infected articles is not known. The disease may be divided into four stages, beginning with the stage of incubation, or the interval (varying from 7 to 21 days) between the date of infection and the outbreak of symptoms, that is, the stage of invasion. The symptoms are chilliness, fever, pain in head, back, and limbs, bloodshot eyes, with intolerance of light, running of the eyes and nose, sneezing, and a troublesome cough. About the fourth day an eruption or rash appears (stage of eruption), first in the throat, then upon the face, trunk, and extremities, as minute pinkish red spots, which coalesce into blotches more or less crescentic in shape, raised above the surface of the skin. The eruption usually lasts about three or four days. Gradually disappearing (stage of decline), fever and catarrhal symptoms abate, and appetite returns. The cough may remain for days. The patient should be kept in a warm, well ventilated, and fairly lighted room, should be given easily digested food and plenty of water. Treatment should also regulate the bowels with saline medicines, and allay the severity of the cough with simple remedies. Severe symptoms require the attendance of the physician. Measles is contagious until the eruption has disappeared and all dead particles of skin have come away of themselves, or have been washed off by tepid baths.

Measure, a definite unit of capacity or extent, fixed by law or custom, by which relative sizes and capacities are ascertained and expressed; as, a yard, a measure of length; a gallon, a measure of capacity; a square foot, a measure of area; a cubic foot, a measure of volume, etc. See WEIGHTS AND MEASURES.

Lineal Measure.— The measure of lines or distances; the standard unit of lineal measure in the United States is the yard. The system is based on the law of nature that the force of gravity is constant at the same point of the earth's surface, and consequently that the length of a pendulum which oscillates a certain number of times in a given period is also constant.

Unit of Measure.— A given quantity, used as a standard of comparison in measuring a quantity of the same kind. Every kind of quantity has its own unit of measure, and under different circumstances the same kind of quantity may have different units of measure.

Line of Measures.— The line of intersection of the primitive plane, with a plane passing through the axis of the primitive circle and the axis of the circle to be projected.

Measure of Angles.— The right angle being taken as the angular unit, its subdivisions are degrees, minutes and seconds. The right angle contains 90 degrees, the degree 60 minutes, and the minute 60 seconds. All smaller fractions are expresed decimally in terms of the second.

Measure of Magnification.— The measure of magnification, or magnifying power of any optical instrument, is the ratio of the magnitude of the image to the magnitude of the object, or more precisely, the ratio of the apparent diameter of the image to that of the object.

Measure of a Ratio.— Its logarithm, in any system of logarithms, or the exponent of the power to which the ratio is equal, the exponent of some given ratio being assumed as unity.

In Music.— The quantity of notes which are placed in the bar, and which is generally called the time, of which there are but two kinds, namely, common time, containing an equal quantity of notes in the bar, and triple time, containing an unequal quantity. Common time is generally marked with a C at the beginning, which means that every bar contains four crotchets, or their value in other notes. There are also other kinds of common time which are marked $\frac{2}{4}$, $\frac{6}{4}$, $\frac{6}{8}$. Triple time is marked $\frac{3}{2}$, $\frac{3}{4}$, $\frac{3}{8}$, $\frac{9}{8}$, $\frac{9}{4}$.

Measure For Measure, a tragi-comedy by Shakespeare, first acted in 1604, and appearing first in print in the ‹First Folio› of 1623. The outline of the plot is taken from the Italian novelist Cinthio, and from Whetstone's tragedy of ‹Promos and Cassandra.› In 1662 an adaptation of the play, entitled ‹Laws against Lovers,› was made by Davenant. Both Benedick and Beatrice appear in Davenant's version. A second adaptation, by Gildon, was produced in 1700 with the title, ‹Beauty the Best Advocate.›

Meas'urement of Ships for Tonnage, or Builder's Measurement, a method of computing the tonnage of merchant vessels, in use among shipbuilders. Its results are nearly double the legal or registered tonnage. See TONNAGE.

Measurement of Streams. One of the many useful classes of work conducted by the United States Geological Survey; the measurement of streams having an industrial value. Wherever water is likely to be employed for power or irrigation the amount available is ascertained by that bureau. The volume varies greatly from season to season, and sometimes from year to year. Any calculation by the manufacturer or farmer which does not take this variability into account would be misleading. Moreover, streams differ among themselves in straightness, the character of their beds and other particulars. Accurate measurement is still further complicated by the lack of uniformity in the movement in a given cross section. What might be true for one point would not be true for other points to the right or left of it, or at a higher or lower level.

The first step in the work is to place a gauge in a permanent position, and employ a suitable observer to read it every day. The gauge is graduated to feet and tenths. Usually it is upright. It may be laid over slanting, however. In that case, the spacing is widened, so as to give accurate results. One observation a day is made, and its result is transmitted on a postal card to Washington. The second factor in the hydrographer's computation is the velocity of the stream, at different heights. To ascertain this only occasional measurements are necessary. These are made by experts, but with their aid it is possible to prepare tables showing the total discharge of that particular stream for all the different gauge readings. After such tabulation is effected the maximum, minimum and mean flow for any month in the year can be told at a glance.

Velocity is ascertained with a meter lowered into the water. The instrument contains a tiny screw propeller, the number of whose rotations under the pressure of the fluid is automatically registered. Many types of meter have been devised. The kind which the bureau prefers has an electric wire leading up to a buzzer in the operator's pocket. There a click or other audible sound indicates to him the speed of the screw. He counts the number of revolutions for some definite period, usually fifty seconds, records it in his notebook, and moves along a short distance to make another observation.

If measurements are made at various depths along a vertical line, the results will not be equal. For this reason hydrographers have studied to find, if possible, a level that would fairly represent the average velocity for any vertical. In this way they can simplify the labor. It has been found that such an average can be secured by taking the speed at a depth of from six tenths to two thirds of the way down from the surface. To obtain a correct idea for the whole stream, though, these tests must be made at a number of places between one shore and the other. No measurement at a single point can be trusted to be fairly representative.

Measuring Worm, Inch Worm, Looper, or Span-worm, a caterpillar of any species of moth of the superfamily *Geometridæ*. The creatures are characterized by the presence of only two pairs of abdominal legs, one upon the ninth, the other upon the anal segment, and by their peculiar form of locomotion, the rear of the body being brought forward toward the front legs and the body forming a loop at right angles to the surface upon which the insects walk. Nearly all the numerous species feed upon foliage, a few upon seeds in which they bore. Some are considered serious pests in orchards and upon shade trees; for instance, the canker worms (see APPLE, paragraph *Insects*), the lime-tree moth (*Hybernia tiliaria*), and *Cymatophora pampinaria*, which sometimes devastates cranberry plantations. The duration of the larva state is variable; from their great voracity they grow rapidly and shed their skins several times before attaining maturity; when arrived at this state they seek some sheltered spot in which to undergo the change to pupa form, some clinging to the lower surfaces of leaves while others bury themselves in the earth, those remaining in the air suspending themselves in various ways by means of their silky secretions, others enclosing themselves in silky cocoons. Those burying themselves also build cocoons around them, but many of these only line their cavity with enough silken threads to keep the wall from falling in. One of the European species, *Fidonia Plumistaria,* is distinguished by curious feathery antennæ. The caterpillars of this species are very injurious to fruit trees, especially those of the European magpie moth, *Abraxas grossulariata,* which inhabit gooseberry bushes, often entirely stripping them of their foliage. The caterpillar of the American canker worm moth, *A. nisopteryx pometaria,* also belongs to this species of worm, the eggs being hatched in the spring; when grown they are about an inch long and of various colors, and are also dangerous to orchards. Most of the species, however, are of small economic importance. The caterpillars usually resemble twigs when at rest, their protective coloring and their attitudes serving to deceive their enemies. The caterpillars of a few species of the owlet-moths, family *Noctuidæ,* walk in this way, since they also lack prolegs upon the middle abdominal segments. They are not, however, considered true measuring worms. The geometrid moths are usually of small size and inconspicuous but delicate and beautiful coloration. Consult Holland, 'The Moth Book' (New York 1903); and Packard's 'Monograph of the Geometridæ,' with colored plates, published by the U. S. Geological Survey in 1876.

Meat, Inspection of. Prior to 1906, no strict government investigation was made of the methods in vogue in meat inspection; but during that year, the investigations of government and other committees disclosed the astonishing fact that a large part of the meat placed upon the market was far from clean; and that, in fact, the methods of handling and preparing these food products were dangerous to health. A great stir was created by these revelations, and much reform work was undertaken. Stricter inspection was enforced; and, whereas this had been little more than perfunctory, it now became more strict; and the result was that more carcasses were "condemned" during 1906 than ever before.

While much reform has been accomplished, there is still urgent need for further investigation and inquiry. The laws governing the inspection of meat are still far from ideal, and the following quotations from the Government Regulations (1904) regarding meat inspection will make this clear:

"All animals found on post-mortem examination, to be affected with any of the diseases or conditions named below, shall be disposed of according to the following instructions. . . .

"1. The carcass may be passed when the lesions are limited to one group of lymphatic glands or one other organ.

"2. The carcass may be passed when the lesions are limited to two groups of visceral lymphatic glands in either the thoracic or abdominal cavity.

"3. The carcass may be passed when the lesions are limited to two visceral organs (other than lymphatic glands), in the thoracic or abdominal cavity, provided the lesions are slight, calcified and encapsulated.

"4. The carcass may be passed when the lesions are limited to one group of visceral lymphatic glands and one organ in the thoracic or abdominal cavity, provided the lesions in the effected organs are slight.

"5. The carcass may be passed when the lesions are confined to two groups of visceral or lymphatic glands, and one other organ in the thoracic or abdominal cavity, provided the lesions are slight, calcified, and encapsulated.

"6. The carcass may be passed when the lesions are confined to the lungs, the cervical lymphatic glands, and one group of the visceral lymphatic glands of the thoracic cavity, provided the affection is slight, and the lesions are calcified and encapsulated." (Twenty-first Annual Report, Bureau of Animal Industry, p. 577.)

The regulations concerning meat-inspection, passed 1 April 1908, contain the following:

"Rule C.— The carcass, if tuberculous lesions are limited to a single or several parts, or organs of the body (except as noted in Rule A), without evidence of recent invasion of tubercle bacilli into the systemic circulation, shall be passed after the parts containing the localized lesions are removed and condemned."

"Section 11, Paragraph 2.— Carcasses of animals showing uncomplicated localized actinomycocic lesions, other than, or in addition to, those specified in paragraph one of this section, may be passed after the infected organs and parts have been removed and condemned."

"Malignant Epizootic Catarrh.—The carcasses of animals affected with this disease, and showing generalized inflammation of the mucous membranes with emaciation, shall be condemned. If the lesions are restricted to a single tract, or if the disease shows purely local lesions, the carcass may be passed."

"Section 16.— Carcasses of animals effected with mange or scab, in advanced stages, or showing emaciation or extension of the inflammation of the flesh, shall be condemned. When the disease is slight, the carcass may be passed."

"Section 21.— Hogs affected with urticaria (diamond skin disease), tinea tonsurans, demodex folliculorum, or erythema, may be passed, after detaching and condemning the skin, if the carcass is otherwise fit for food."

"Section 12.— When the lesions of caseous lymphadenitis are limited to the superficial lymphatic glands, or to a few nodules in an organ, involving also the adjacent lymphatic glands, and the carcass is well nourished, the meat may be passed, after the effected parts are removed and condemned."

"Carcasses of animals slightly affected with tapeworm cysts may be rendered into lard or tallow, but extensively affected carcasses shall be condemned." (p. 15.)

"Section 17, Paragraph 3.— Carcasses or parts of carcasses found infected with hydatid cyst (echinococcus) may be passed after condemnation of the infected part or organ."

These are some of the rules and regulations which pertain to the inspection of meat in the United States. From these quotations it is perfectly obvious that there is urgent need for further reform in the selection and condemnation of meat.

A great amount of slaughter goes on without any government inspection in various parts of the country. There are three main sources of meat supply: (1) wholesale houses; (2) slaughter by small butchers; and (3) farm slaughter. The slaughter by small butchers is a great menace to public health, as thousands of pounds of meat, much of it diseased, are annually circulated from such quarters, and sold at the same price as meat which had been subjected to Federal inspection.

These small slaughter houses are the main source of danger, for in a large number of cases they are not kept in a clean or sanitary condition. The drainage is not attended to and offal is not disposed of for days together. In a recent report made by the State Board of Health of Indiana it was asserted that: "Of the 327 slaughter houses inspected, only 23, or about 7 per cent. were found to fulfill the sanitary conditions."

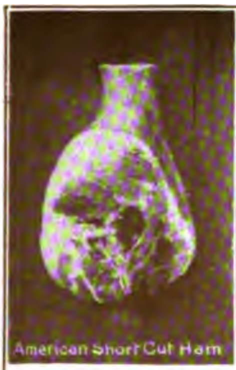
The unwholesome and unsanitary condition of some of the abattoirs has, however, led to an effort to better the existing conditions; and, in his annual report to the legislature, Raymond A. Pearson, Commissioner of Agriculture, recommends that legislation be provided for the proper surveillance over the abattoirs of the State. The commissioner points out that practically only the inspected meat sold in New York State is the product of the abattoirs enjoying Federal inspection,— which is limited to those plants doing an interstate business.

Meat Extract, or juice of meat, has become since its introduction by Liebig (q.v.), a subject of great importance in medicine, dietetics and commerce. The chemical constituents of meat juice are not clearly established, although creatine, sarcine and inosinic acid are among the substances intelligently investigated. Phosphoric and hydrochloric acids and inorganic salts, with some coagulable ingredients are among the constitnents. Beef tea while of value does not furnish complete food either for sickness or health.

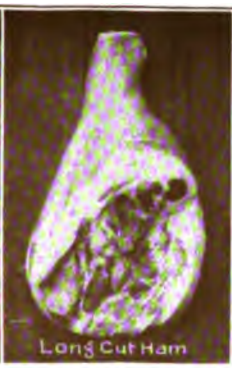
Meat-packing. Meat-packing may appropriately be considered under three heads, namely, preparation and disposal of fresh (unsalted) meats; curing and preservation of meats by salting, smoking and the like, as is usually practised with hog hams, bacon, etc., and preservation of meats by hermetically sealing in tin cans, glass jars, etc., including the final sterilization necessary to complete the process.

Fresh Meat.— The preparation and disposal of fresh meats is perhaps the most important branch of the packing industry and in its development is the newest. Fresh meat has been, of course, an article of commerce from the earliest times; but it is only within recent years that the art of refrigeration has been perfected to an extent enabling fresh meat to be shipped thousands of miles and its condition and quality so conserved that it is more desirable and palatable after arrival at destination than when first slaughtered. Fresh beef, particularly, is much more juicy and tender if well refrigerated and kept two weeks or more after slaughter Fresh meats will keep best if held in a temperature slightly above the freezing point, but in practice a temperature of 35° F. gives good results, except for long shipments such as from United States ports to Europe, in which cases approximately the freezing point should be main-

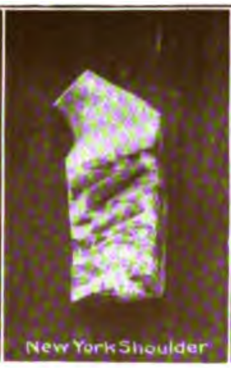
MEAT PRODUCTION.



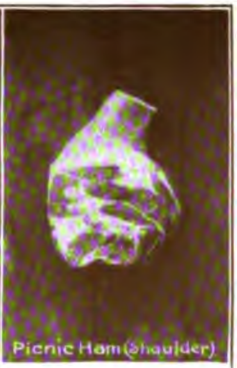
American Short Cut Ham



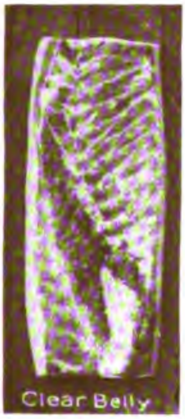
Long Cut Ham



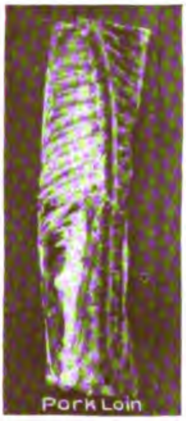
New York Shoulder



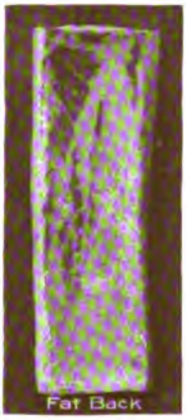
Picnic Ham (Shoulder)



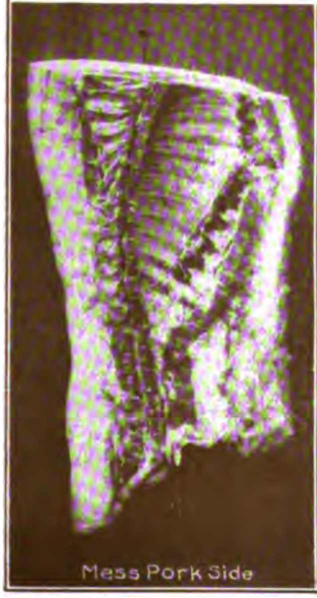
Clear Belly



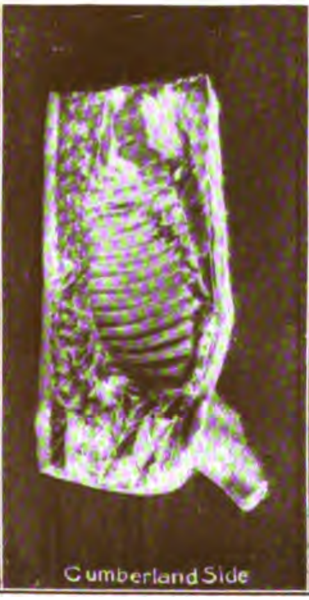
Pork Loin



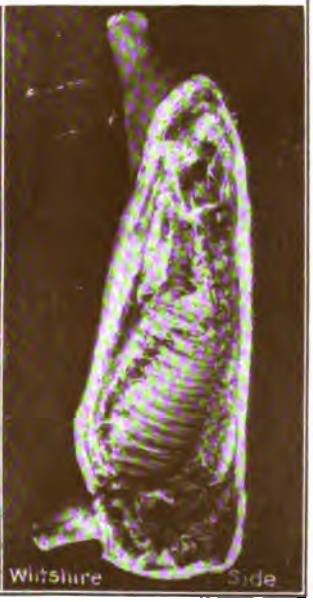
Fat Back



Mess Pork Side



Cumberland Side



Wiltshire Side

tained; and it may here be observed that lean meat freezes at about 1½° lower temperature than water.

Freezing is slightly injurious to the quality of fresh meat, but by freezing hard and holding at a temperature of 10° F. it may be kept without taint for many months. When beeves are in good supply and cheap, the choice cuts, such as ribs and loins, are frozen and held in large quantities until the winter and spring season, when they usually meet with a more favorable market. Fresh pork and mutton are sometimes frozen and carried from season to season, but the volume of this trade in the United States is not great, comparatively. This carrying from the season of over-supply to the season of under-supply by means of freezing has a doubly beneficial effect on the market, increasing the demand for live stock during time of glut, and increasing the supply of choice cuts during the time of scarcity.

The dressed carcasses are, immediately after slaughter, still being suspended from the trolley hooks on which the latter part of the dressing operation is done, run into refrigerated rooms and chilled, usually for two days. The cattle carcasses, and usually the hog carcasses, are split through the back bone into «sides.» After chilling, the sides are cut, the beef usually into quarters and the pork into smaller pieces. The quarters of beef are shipped hanging on hooks in refrigerator cars, and the smaller pieces intended for sale fresh are usually boxed and shipped also in refrigerator cars. Mutton and lamb are shipped in the same way, usually in whole carcasses. The refrigerator cars used depend upon ice for their temperatures, and the most successful cars use the ice crushed and with from 6 to 12 per cent of rock salt intermingled.

The development of the fresh meat branch of the packing industry received its first important impulse from George H. Hammond, who, in the summer of 1869, began at Hammond, Indiana (a suburb of Chicago), the business of shipping fresh beef in refrigerator cars to Boston. The first year the business was not successful, but it was courageously continued, the difficulties were gradually overcome, and the second year found it more satisfactory, and the volume amounted to about 600 quarters per week. During the following two years this volume was doubled and it continued to grow moderately until, in 1877, Gustavus F. Swift established at the Union Stock Yards, Chicago, a similar business. Under the stimulus of this competition the trade increased rapidly, consignments were made to other cities in New England and New York, other houses entered the trade, and by 1885 it became apparent that this new method of slaughtering cattle near their native pastures and shipping the fresh meat, was destined to supersede, largely, the older method of shipping them on the hoof and slaughtering near the place of consumption. To-day, in 1905, nine tenths of the fresh beef used in the principal cities east of Chicago, and out of the cattle raising belt, arrives at destination in refrigerator cars, and local slaughtering has been largely abandoned. What is true of fresh beef is true also of fresh mutton and pork.

In the early days of the fresh meat branch of the packing industry, it became apparent that new methods of handling and disposal at destination were necessary; obviously, *fresh* meat could not be received in carloads and distributed to the retail dealer, through an ordinary, unrefrigerated warehouse, as had been the custom with cured meats. To meet the necessities of the case, refrigerated rooms were built, with systems of overhead tracking, on which quarters of beef and carcasses of small stock were stored and handled, suspended from trolley hooks. In connection with these refrigerated rooms, or *beef coolers,* as they came to be known in the trade, there were built suitable shipping rooms, offices, etc. These distributing houses were, as a rule, built adjacent to railroad tracks, enabling the direct discharge of meats from the cars. As the business began to assume some magnitude, it became evident to the packers that great care in the construction, maintenance and operation of these distributing houses was of the utmost importance; it was therefore desirable that a packer own houses for distributing his fresh meat, thus being in position to control, absolutely, conditions of cleanliness and temperature. The earliest fresh-meat packers did not engage in the other branches of meat-packing; but as soon as it became apparent to the older packers, who had previously confined their fresh-meat business to the locality of their packing houses, that the new method of distribution was successful, they began to enter the fresh-meat business aggressively, which in turn forced the pioneers of fresh-meat packing to add the other branches to their business, because a packer having all kinds of meat product to offer to the retailer had an obvious advantage. This diversification caused, in turn, the development of the distributing house, the addition of smoke-houses for smoking hams and bacon, store-rooms for canned meats, lard, etc., until to-day the leading packers own, in the principal cities of the country, their distributing houses, where the retailer may obtain any form of animal food-product, including many by-products. There are more than one thousand such houses scattered throughout the United States. This branch house system of distribution, by its economy and thoroughness, and its adaptability to supply a wide variety suited to all the local needs, has been one of the prime factors in the growth of the meat-packing industry.

The beginning of this branch of the packing industry was coincident with the successful application in a large way of refrigeration to railroad cars. The first cars were, however, comparatively crude, and the modern refrigerator car, as used to-day by practically all of the packing companies, has reached its present state of development by a steady growth of improvements made from time to time. This matter of perfection of the refrigerator car has been one in which there has been great rivalry among the various packers, and to this competition is due the high efficiency of the present refrigerator car for carrying fresh meat. The building, maintenance and care of these refrigerator cars is the field of one of the most important departments in connection with the various packing companies. The cars must not only be kept in first-class running order so as to make them suitable for operating on fast trains, but they must be kept in a high state of cleanliness. The icing of the cars is also a very important feature and has to be done with the utmost care. Before loading, the cars must be iced at least 24 hours in advance, so as to be thoroughly cooled. They are then re-iced at the time of shipment and are re-iced in transit as necessary, depending upon the length of the journey. Immediately after unloading, the car is scrubbed with soap and hot water, all hooks are wiped clean, and the car is ventilated so that it will return home in a sweet, clean condition.

Curing and Preservation by Salting, Smoking, etc. — The preservation of meat by salting, smoking, etc., was the first method extensively practised, and the term «packing» now applied to the whole business, formerly had a narrower meaning and was used in connection with this branch exclusively. In fact this was, in the early days, the only branch.

From the earliest times meats have been cured by salting and smoking and in principle there is nothing essentially different in the practice of the modern packing plant from the curing processes used by the packers of earliest days. The business is now conducted on a much larger scale, and with more care as to conditions, particularly as to refrigeration and sterilization, so that meats are now cured with less salt than formerly, or to use the trade expression, *mild cured.*

The two methods of curing with salt are known as «pickling» and «dry salting,» and these terms are relatively descriptive. In pickling, the meat, after being cut into hams, shoulders, etc., is submerged in pickle or brine and kept under the surface with weights or other devices, so the salt in the pickle is diffused through the meat. This causes the strength of the pickle to decline and the meat must occasionally be removed, and placed in a fresh hogshead with re-strengthened pickle. The usual time of cure varies with the size of the joints or pieces of meat, but ranges usually between 30 and 45 days. The pickle is made of various strengths for various cuts of meats, but is generally 40° to 60° salometer, and for hams, bacon and the finer cuts of meat contains sugar as well as salt. Some curers also use small amounts of other salts of sodium, but the modern tendency is to use nothing but common salt, and sugar. Meats for consumption in the United States are generally cured in sweet pickle.

The process of dry-salting is to pile the joints or cuts of meat closely in layers on the curing floor, first rubbing them thoroughly with salt, and sprinkling salt freely between the layers and on top. The piles are made three or more feet in height, and the meat is left for ten days, when it is overhauled, rubbed again with salt and re-piled; and this overhauling is repeated again in another ten days. The time necessary for the curing by the dry-salt method is substantially the same as by the pickling method. The dry-salting method is used for most meats for exportation to Great Britain, and the method is frequently spoken of as «English cure,» being the standard method in England.

Hams, shoulders, bacon and side meats are, after curing, generally smoked. The process of smoking is also quite old and its origin unknown. The meats are hung in brick houses or compartments in tiers, as closely together as practicable without touching, a slow fire of wood is built beneath, and the meats kept in the resulting smoke for 12 to 48 hours. They are then cooled, wrapped, boxed and made ready for shipment. Hams and bacon, also shoulders, generally have a brand burned in the skin before wrapping. For shipment to hot climates the pieces, after wrapping in paper, are also «canvased,» or sewn up in cotton sheeting, and coated with a thick pasty solution of China clay, barytes or the like, and then dried. This forms an air-tight, vermin-proof covering. Hickory and sugar maple are the best woods for smoking.

The preceding paragraphs relating to the curing of meats by salting, smoking, etc., describe the process as applied to meats of the hog. Beef is cured in like manner by pickling and is generally shipped to destination and kept in the pickle until removed for consumption. An exception is «dried beef,» being the suitable lean pieces, which, after curing in pickle, are smoked slowly for several days so as to dry them to a firm condition.

Preservation by Hermetically Sealed Cans, etc. — The method of preserving meat by packing in hermetically sealed tin cans and the like was introduced commercially into the United States about the year 1873 at Chicago, Illinois, by William Wilson and John Wilson. In the following year Libby, McNeill & Libby also entered this trade, and during succeeding years other houses followed. The business grew rapidly from the beginning, and has reached great magnitude.

The process in brief is as follows: The meat after being trimmed from the bones and cut into small pieces is put into a curing pickle composed of common salt and a little sugar in solution; also a very small quantity of saltpetre is commonly used. It is left in this pickle any length of time from a few days to 20 days, depending upon the degree of saltiness desired. It is then taken out of the pickle and cooked in hot water until thoroughly done. After this the gristle is trimmed out, the surplus fat is removed, and the pieces are cut into small and comparatively even sized bits, usually not exceeding four cubic inches. In this condition, and while still hot, it is stuffed by an automatic machine into tin cans which have previously been prepared and thoroughly washed. Each can is then weighed so as to get the correct quantity of meat in it, and is «capped,» that is, a small tin disc is soldered over the hole through which the meat is introduced into the can. The further steps of the process embrace the sterilization, or so-called «processing,» which consists in heating the cans for a number of hours up to a temperature of 250° to 350° F., depending upon the size of the can and the kind of meat. The object in heating is sterilization, being the same process as is pursued by the house-wife in canning fruit, etc. The cans are then washed, cooled, labeled and the exposed surfaces are coated with a varnish to prevent rust. They are then ready to be packed and shipped to all parts of the world, and will keep for years without deterioration.

By-products.—The business of meat packing as practised in Chicago and the other large packing centres of the United States involves not alone meat preserving, but the entire range of slaughtering, preparation of the fleshy and other edible parts, and preparation of the by-products, such as hides, hoofs, horns, bones, hair, fats, intestines, blood and viscera. In many of the most prominent es-

MEAT-PACKING

- **BOVINE**
  - **Beef**
    - Hindquarters
    - Forequarters
  - **Tail**
  - **Sweetbread**
  - **Kidneys**
    - Not separated from hindquarters
  - Edible
  - **Head**
    - Tongue
    - Meat
    - Brain
      - Edible
    - Bones
      - Glue
      - Phosphatic fertilizing material
        - or raw
        - bone meal
    - Horns
      - Combs, Buttons, Ornaments, etc.,
      - Cuttings
        - Potassium ferrocyanide or
        - Nitrogenous fertilizing material
    - Horn piths
      - Glue
      - Steamed bone
    - Tallow
  - **Feet** (Including leg from knee downward)
    - Hoofs
      - White and striped
        - Combs, Buttons, etc.
        - Cuttings
          - Potassium ferrocyanide or
          - Nitrogenous fertilizing material
      - Black and inferior
        - Potassium ferrocyanide or
        - Nitrogenous fertilizing material
    - Neatsfoot Oil
    - Bones
      - Shin
        - Buttons, Handles, etc.
        - Cuttings
          - Gelatine
          - Phosphatic fertilizing material
      - Joint and Toe
        - Glue
        - Phosphatic fertilizing material
          - or raw
          - bone meal
    - Sinews
      - Glue
      - Grease
      - Nitrogenous fertilizing material
  - **Hide**
    - Leather
    - Hair
      - Body hair
        - Plasterers' hair
        - Hair felt
      - Long hair of the tail — curled hair
    - Pate
    - Leg and Tail
    - Trimmings
      - Glue
      - Grease
      - Nitrogenous fertilizing material
  - **Blood**
    - Blood Albumen
    - Food for animals, particularly for calves
    - Nitrogenous fertilizing material
  - **Viscera**
    - Heart
    - Liver
      - Edible
    - Stomach
      - Tallow
      - Tripe
    - Respiratory Organs
    - Melt
      - Desiccated animal food
      - Nitrogenous fertilizing material
    - Entrails
      - Grease
      - Sausage casings
    - Bladder
      - Is inflated with compressed air, dried and is used for containing paints, putty, etc.
    - Gall
      - Sac — Fertilizing material
      - Fluid — Desiccated for medicinal purposes
    - Weasand
      - Meat dried for poultry food
      - Sausage casing
  - **Caul and Interior Fat**
    - Oleomargarine
      - Combined with other ingredients into butter substitute
    - Oleo-Stearine
      - Combined with other ingredients into lard substitute
    - Tallow and Grease
      - Oil
      - Glycerin
      - Soap
      - Candles

tablishments these by-products are manufactured into the resulting leather, glue, buttons, combs, curled hair, soap, candles, oils, glycerin, etc. Largely for sanitary reasons, all the modern establishments manufacture the blood and residual solids from their fat rendering apparatus into fertilizers, in some cases the blood-albumen being first separated and dried independently.

The annexed diagram will illustrate graphically the disposition usually made of the different parts of beef cattle.

Corresponding parts of other animals are put to similar uses. The stomachs of hogs are utilized for pepsin manufacture. Some of the glands of hogs, sheep, and cattle, notably the thyroid and pancreatic, are used in the production of pharmaceutical preparations. Sheep skins first have the wool pulled from them and are then utilized for leather, the cuttings being made into glue. Hog hair and bristles are made into curled hair and brushes. Curled hair is sold for mattress making. All scraps and parts, not put to some more important use, are cooked, desiccated and used for fertilizing material, the chief property of which is nitrogen.

General.—By the careful study of economy in utilization of by-products at least $1.00 to $2.00 of value per head is now derived from parts formerly wasted. To-day there is practically nothing wasted. This close study of economy in saving everything enables the packing business to be done on an unprecedentedly small margin of profit. For a series of years, including 1904, the fiscal reports, made by some of the largest and most successful packing corporations to their stockholders, show that their profits ranged from 1½ to 2 per cent of their distributive sales.

It must occur to all thoughtful persons that in a business of such large volume the securing of steady and sufficient supplies of fat animals is of prime importance, and the query naturally comes as to how this is done. Almost the entire supply of live stock is purchased from day to day, as needed by the various packing companies, at central markets in the large cities, such as the Union Stock Yards of Chicago, Kansas City Stock Yards of Kansas City, National Stock Yards of East Saint Louis, etc. These stock yards are equipped to receive live stock in train loads — unload, pen, feed, water, and otherwise care for the comfort and health of the animals.

Live stock raisers most frequently sell their animals at home to a dealer, who, in turn, consigns to a commission salesman at some central market, where the buyers for the various packing companies meet in competition and bid for each lot or carload. The bidding is not by public outcry or auction, but by each buyer independently. There is no public system of grading, but each purchase is made on individual inspection and judgment of the buyer and salesman.

The development of these stock yards has kept pace with the growth of the packing industry. Indeed, these large central markets for live stock and the packing plants are interdependent and mutually helpful. Together they constitute one of the modern wonders of our commercial development. The benefits to the raiser of live stock, the live stock dealer, the transportation companies, the retail dealer, and to the consumer, of an organized business that affords the producer an every-day cash market for any number of animals, the carrier a reliable and steady freight volume, and the retailer — and through him the consumer — a constant supply of the widest variety of kind and quality of animal food products, can hardly be exaggerated. To appreciate these benefits, let the reader try to imagine a return to the conditions of a generation ago. Within the memory of many still engaged in the business, the farmer had only a local and very uncertain market for his live stock. He could sell in limited numbers, must find his customer by inquiry, and frequently had to wait for weeks after his stock was ready and ripe for slaughter. The butcher also depended on local supply, and must needs ride through the countryside and inquire, and frequently felt compelled to buy and use stock of a quality not suited to the demands of his business. He had to drive the animals to his little, unsanitary abattoir, slaughter them himself in the cool hours of the night, and hurry the sale of the fresh meat before incipient decomposition. He was constantly oversupplied or undersupplied, had too much of one grade and too little of another, and so frequently met with losses that his margin of profit must needs be large. The consumer, of course, could fare but ill under these conditions. He might whet his appetite with the thoughts of a juicy porterhouse or a prime rib roast, and find his butcher could furnish only veal or pork chops, and was compelled constantly to choose from a narrow and unattractive variety, and to pay an excessive price. Values were unstable and varied greatly, and producer, dealer, and consumer alike suffered.

To-day the modern packing house, with the central market for live stock which it has built upon one hand, and its system of refrigeration and distribution on the other hand, brings the producer and consumer into such near touch that the one can market his animals in any numbers any day, and the other can buy in any town or village of the country having railroad connections, any desired quantity and quality of so wide a variety of animal food products that his slightest whim or necessity can be satisfied.

This bringing together of the producer and the consumer, the modern packer, with the aid of our railroads, stock yards, and refrigeration, has accomplished, to the enormous benefit of both; and to-day the actual producer gets a much larger part of the total price paid by the actual consumer than ever before.

In this age of engineering and mechanical advancement, the use of machinery has, of course, played a prominent part in the development of the business of meat-packing. The modern packing plant is divided into many departments, so related with reference to each other that the whole, in reality, constitutes a vast machine. The invention and perfection of machines to do the various kinds of work has been given a great deal of attention, and the practical men in connection with the different packing companies have vied with each other so that improvement has followed improvement, in many cases one machine being improved by another before fairly having the new worn off. To-day, in the most up-to-date packing plants, the vast majority of the operations carried on are done by machines. Such plants are operated entirely by electric power, are lighted by electricity, supplied with water by electric pumps, refrigerated with cold brine circulated by electric pumps, and in some cases even the live animals themselves are hoisted from the ground to the top floor of the slaughterhouse by enormous electric elevators, carrying a carload at a time. They are hoisted to meet the knife by means of electrically-driven hoists. Hogs are scalded, scraped, cleaned, and delivered to the chill-rooms by machinery, hand work being reduced to less than half what it formerly was. The meats are cut by machinery, also sprinkled and rubbed with salt and packed. Hams are branded by machinery, and are carried by mechanical means to the loading platforms, ready to go into the cars.

In the handling of by-products, various machines do all of the most important work. Fertilizing materials are cooked, pressed, dried, ground, sifted, and packed in bags and weighed by machines. Bones are dried, sawn, made into knife handles, buttons, crochet hooks, etc., largely by automatic machinery. Glue is evaporated, the jelly sliced, dried, broken, ground, bolted, and packed into barrels by machinery. Soap is cut into bars, stamped, wrapped, packed into boxes, and the boxes nailed, and printed by machinery. Soap powder is mixed, ground, sifted, packed into cartons, labeled, pasted, and delivered to the boxes by machinery. So on, throughout the various departments, great attention has been given to the introduction and perfection of machines, so that the modern packing plant, volume considered, uses no more than half the hand labor that would have been required 20 years ago to do the same amount and variety of work.

Owing to the nature of the business and its wide diversification, statistics of meat packing for the entire country are not available. Slaughtering is done in every village, and almost every small butcher, to a certain extent, cures and smokes meat.

For many years trade papers, notably 'Cincinnati Price Current,' have, so far as practicable, kept records of pork packing at principal points in the East and West, and have published figures which, for pork packing, are probably approximately correct, for all packing done at points east of the Rocky Mountains and at plants doing any considerable volume of business. These points are divided into «Western» and «Eastern.» The «Western» points include:

Illinois: Chicago, Bloomington, Peoria, Alton, Quincy. *Missouri:* Kansas City, South Saint Joseph, Saint Louis, Cape Girardeau, Jackson. *Nebraska:* South Omaha, Nebraska City. *Indiana:* Indianapolis, Ft. Wayne, Logansport. *Wisconsin:* Milwaukee, Cudahy, Eau Claire, Jefferson, La Crosse. *Ohio:* Cincinnati, Cleveland, Dayton, Toledo, Hamilton. *Minnesota:* Saint Paul, Austin. *Iowa:* Sioux City, Cedar Rapids, Ottumwa, Des Moines, Marshalltown, Davenport. *Kentucky:* Louisville. *Michigan:* Detroit. *Kansas:* Wichita, Topeka, Leavenworth. *Texas:* Fort Worth, Dallas, Sherman. *Pennsylvania:* Pittsburg, Allegheny, *West Virginia:* Wheeling. *Tennessee:* Chattanooga, Knoxville, Morristown. *Colorado:* Denver.

The «Eastern» points include:

Massachusetts: Boston, Worcester, Brightwood. *Connecticut:* New Haven. *Rhode Island:* Providence. *New York:* Albany, Troy, Hudson, Buffalo, New York. *Pennsylvania:* Pottsville, Allentown, Bridgeport, Coatesville, Harrisburg, Mt. Carmel, South Bethlehem, Philadelphia. *Maryland:* Baltimore.

The figures for cattle and sheep slaughtering cover a much smaller number of places, and no figures of actual slaughtering are available except for the leading packing centres. For the large Eastern cities, New York, Boston, Philadelphia, and Baltimore, no figures for actual slaughtering can be obtained, but accurate figures are available showing receipts of cattle and sheep, which, presumably, correspond with local slaughtering.

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Meats and Meat Production. The discussion of the subject will be confined to a consideration of the properties, use and production of the flesh of cattle, sheep and swine for human food. All organic matter is made up of dry substance and water. The per cent of water in meats varies from 10 to 78. Moisture in meat or other foods aids in the various processes of digestion, especially in mastication. It also assists in the assimilation of foods. The two things which appear to have the greatest influence upon the percentage of water in meat are the age and condition of the animal. Other things being equal, the younger the animal the more water its flesh contains, while the higher the percentage of fat in meat the lower the percentage of water. From 50 to 65 per cent of the fat steer is meat. The remainder is made up of by-products, in general, such as hides, fat, offal, etc., less valuable than beef. A physical examination of meats shows them to be made up of muscular tissue or lean meat, fatty tissue or fats, connective tissue or the gristle, and bone. From the standpoint of the nutritive value of meat, gristle and bone are practically refuse.

Composition.— Chemically, meat is composed of proteids, fats, water, ash, and carbohydrates, which are the necessary food constituents for the production of energy and repair of the animal body. The amount of carbohydrates is so small as to make it almost a negligible factor. Extractives are also present in meats which are believed to be responsible for meat flavors. While differences in the chemical composition of two cuts of meat are not necessarily an indication of their relative food value, yet the composition of meats in general is important as indicating their place in the diet of man. Lean meat contains from 15 to 21 per cent proteid; whole eggs, 12.5 per cent; fresh, whole milk, 3.4, and cheese from 25 to 30 per cent. Fresh vegetables, other than peas and beans, contain 0.5 to 3 per cent proteid; fresh peas and beans, 12.5 per cent; wheat flour, 10 to 12 per cent, and dry peas and beans 25 to 30 per cent. Thus it will be seen that meat contains a relatively high percentage of proteid, a most necessary food constituent, and one which is generally found in too limited quantities in human food. Good authorities agree that the supply of protein should be abundant, since as far as is known it is the only source of bodily repair. Protein may take the place of carbohydrates and fats in animal nutrition to a limited extent, but carbohydrates and fats cannot take the place of protein. The mineral matter comprising the ash of meats is made up chiefly of calcium phosphate and potassium phosphate. The percentage of ash in fresh edible meats varies from 0.5 to 1.5. Meat sugar comprising about 0.5 per cent of meats figures but insignificantly as a carbohydrate. The percentage of proteids is the least variable of any of the constituents of meat. The necessity of proteids is understood when we conceive that the body is made up of 50 per cent muscle and that one third of the muscle is protein. Good authorities agree that at least one third of the proteids required by the body should be furnished by animal products.

Nutrition.— From one tenth to one third the cost of food in the average family is paid out for meats. Some facts are given therefore which throw some light on the question as to the desirable qualities of beef. Beef is used to illustrate the matter of quality because it is pre-eminently the most popular flesh food and because quality means more in beef than in mutton or pork, especially the latter. If all the desirable qualities of beef could be secured in one cut it would be palatable, nutritious, and economical. This is practically impossible, however; there are wider differences in cuts of meat as to palatability and cost than as to food value, while the less expensive cuts may be rendered more palatable by proper methods of cooking. Palatability of beef depends upon tenderness, juiciness, quality and flavor. Tenderness, juiciness, quality and flavor depend upon the age of the animal, the location of the cut, the condition of the animal as to ripeness, the degree of ripeness of the meat and the method of cooking. As a rule the younger the animal the more tender the meat. Perhaps nothing, however, has more influence upon tenderness than cooking,— different cuts requiring different treatment. The flesh of young animals invariably lacks that fine marbled appearance, or distribution of fat throughout the muscular tissue that is so characteristic of beef of high quality taken from mature bullocks that are in a finished or well fatted condition. The beef of young cattle is also more or less lacking in flavor. Satisfactory flavor in beef is of course largely a matter of individual preference, but a reasonable state of maturity and development is required to give beef its most characteristic flavor. It is significant that the more tender cuts of beef, such as the tenderloin, lack noticeably in flavor. Good judges agree that the best flavored beef comes from muscles which are frequently used during the life of the animal. This exercise renders these muscles tougher, but of distinctly higher flavor. Beef cut from cattle of rather advanced age or for that matter from cattle of any age, is rendered relatively more tender by the ripening process. Fresh beef that has not hung in the cooler for ten days to two weeks lacks both in tenderness and flavor. Even a longer time in cold storage is desirable with the highest grade of beef. The beef cut from well fattened steers of good quality or containing a high percentage of beef blood can be much more satisfactorily ripened in cold storage than that cut from mongrel bred steers which have been slaughtered in an indifferent condition. Carcasses of prime steers possess a characteristic coating of surface fat which protects the lean beef from too much exposure and gives it an opportunity to fully ripen. In the case of the carcass from the medium and common grades the beef frequently lacks that surface fat which seems to serve such a useful office during the ripening process. Low grade beef will literally rot before it will ripen. Juiciness in beef is largely dependent upon the percentage and distribution of fat, and the method of cooking. While an abundance of fat anywhere on a cut of beef adds materially to its apparent juiciness, an even distribution of fat throughout the muscular tissue, a condition which gives to the meat when carved (especially when cold) that beautifully marbled appearance, is the leading factor in contributing ideal juiciness to the beef. Juiciness may be easily destroyed by too prolonged roasting or broiling. The marbled quality in beef is seldom seen except in reasonably mature, well fatted cattle.

Prime condition in the live animal is essential for producing high quality in beef and other meats as well. In order to secure the highest quality in meats the consumer must pay a relatively high price for the cuts of meat or buy considerably more fat than can be agreeably eaten along with the lean of the cut, thus making it necessary to utilize the superfluous fat for other purposes or consider it as waste or refuse. In either instance it renders the edible meat of high quality relatively high priced as compared with low grade meat. On the other hand, meat of high quality need not necessarily be the most expensive for the consumer to purchase; for, when properly cooked, it is so delightfully tender and juicy that all of it is edible, save possibly a small amount of superfluous fat. However, this extra fat is of such quality that it can be readily rendered and used for cooking purposes to supplement or in some instances satisfactorily take the place of more expensive shortening. Another fact which should not be overlooked is that the cheaper, and as generally considered, less palatable cuts taken from a carcass of beef possessing high quality are often fully as desirable as the best cuts from low grade carcasses.

Packing.— The packer or slaughterer of meats is willing to pay a premium for animals in prime or well fatted condition because when slaughtered they yield a higher percentage of dressed meat, fat, and, in the case of cattle, hides. Not only is this true, but the packer understands that prime condition in the live animal is a strong indication of high quality in the carcass. In fact, it may be said that condition is a prime requisite for producing high quality. It has a greater influence undoubtedly than high breeding. Again, the packer pays a premium for cattle prime in condition and prime in quality, or good breeding, because in well-bred animals the percentage of high priced cuts is greater than in mongrel or indifferently bred stock. Undoubtedly, the tendency of the meat trade for several years has been to concentrate a large part of the slaughtering of the country at leading market centres like Chicago. In other words, gigantic and powerful packing companies have developed from small beginnings until they have within their combined power the ability to practically regulate the market for live cattle, hogs and sheep and meats the world over. Chicago, the greatest live stock and meat market in the world, is each year enormously increasing its business in buying and slaughtering live stock. A large majority of local meat markets in the cities and villages throughout the United States are supplied through the medium of the packing houses located at our leading live stock markets. Packing houses can furnish any grade of meat desired. For example, in beef they can supply all grades from No. 1 to canning stock at prices corresponding with the quality. So economically is the business of the packing houses administered and so well organized are the various industries growing out of the wholesale slaughter of meats that it is possible for them to sell practically all grades of beef in cities and villages remote from their central plant at prices which successfully compete with local competition. The local purveyor of meats can buy whatever grade of meat he can dispose of to advantage. As a rule in the smaller cities and villages the retailer buys a medium to low grade carcass, because his trade is not willing to pay prices which of necessity must be paid to secure meat of high quality. It is safe to say that the beef offered at such markets is seldom above No. 2 in grade, no matter whether the market is supplied by packers or local slaughterers.

It is impossible to predict the ultimate effect upon the meat trade of the change from local to packing house slaughtering. On the one hand a packing house trust can control the price of live cattle, sheep and swine in such a manner as to reduce, temporarily if not permanently, or in some instances, destroy entirely the profits of the meat producing industry; on the other hand, such a trust can control the price of meat in the carcass to such an extent as seriously to discourage the consumption of meat by raising the price to such a degree that it will become one of the most expensive articles of diet. This power is not likely to be permanently exercised to the disadvantage of the public good, for it should be borne in mind that the very life of the packing business depends upon an active demand for meats by the consuming public. This demand will not exist when prices of meats are too high as compared with other food-stuffs. Producers will cease to prepare live stock for the block when the business becomes clearly unprofitable. In other words meat is not an absolutely necessary part of the diet of the masses, nor is the permanency of agriculture dependent upon continuous live-stock production.

Consumption and Production.— Notwithstanding improved methods for meat production the actual cost of cattle, sheep and swine as put upon the market by producers the world over is steadily on the increase. Nowhere is this increased cost any more manifest than in the United States. Changes already referred to in the methods of slaughtering and increased cost of production of meats have not lessened the gross or even the per capita consumption of meats in the United States or Great Britain. The per capita consumption of beef in the United States has increased 15 per cent in the last few years, while it is probable, although statistics are wanting to substantiate the statement, that the per capita consumption of other meats has increased still more. The table at the bottom of this page, from Williams' 'The Foreigner in the Farm Yard,' shows the increase in per capita consumption of meats in the United Kingdom of Great Britain:

CATTLE AND BEEF PRODUCED IN THE WORLD.

Country	Number of cattle other than milch cows	Annual tons beef
United States	53,100,000	3,059,000
Russia (in Europe)	27,600,000	1,546,000
Argentina	22,900,000	
Germany	17,600,000	985,000
Austria-Hungary	14,200,000	795,000
Australia	13,300,000	325,000
France	12,900,000	784,000
Great Britain	10,900,000	661,000
Italy	5,000,000	280,000
Spain	2,100,000	112,000
Remainder of Europe	13,900,000	779,000
Canada	4,200,000	235,000
Total	197,700,000	9,561,000

The following table shows the annual per capita consumption of meat, including beef, mutton, and pork, for different countries:

ANNUAL PER CAPITA CONSUMPTION OF MEAT.

	Pounds
United States	150
Great Britain (England and Scotland)	117 to 130
Germany	101
Norway	80
France	79½
Spain	70
Sweden, Belgium and Switzerland	61 to 70
Bohemia and Hungary	31
Russia	27
Portugal	27
Holland	27
Ireland	27
Italy	27
Austria-Hungary	27

Of all the above countries probably Italy consumes less meat per capita than any other.

As a nation the United States leads all others in the production of meat. The table presented herewith shows that the United States produces one third the world's supply of beef. The United States also produces more than one half the pork and one seventh of the mutton of the

MEATS OF ALL KINDS CONSUMED IN THE UNITED KINGDOM.

Average Annual Consumption.

Date	Home	Foreign	Total	Home per head	Foreign per head	Total per head
	Tons	Tons	Tons	Pounds	Pounds	Pounds
1868–70	1,267,000	123,699	1,290,699	91.81	8.96	100.77
1878–80	1,284,000	452,158	1,736,158	84.25	29.66	113.91
1888–90	1,354,984	560,241	1,915,225	81.62	33.76	115.38
1891–93	1,425,662	636,719	2,062,381	83.72	37.45	121.17
1894–96	1,388,817	759,637	2,148,454	79.51	43.44	122.95

The above table shows that the per capita consumption of meat in Great Britain is steadily on the increase.

world. Not only does this nation produce more meat than any other country, but the per capita consumption of meat is greatest:

WORLD'S CONSUMPTION OF MEAT.

	Tons
United Kingdom	1,880,000
France	1,250,000
Germany	1,720,000
Russia	2,270,000
Austria	1,160,000
Italy	370,000
Spain	430,000
Portugal	100,000
Sweden	160,000
Norway	70,000
Denmark	80,000
Holland	100,000
Belgium	160,000
Switzerland	120,000
Danubian States	380,000
Greece	70,000
Europe	10,320,000
United States	3,950,000
Canada	250,000
Australia	450,000
Argentina	280,000
Total	15,200,000

The accompanying table is interesting as showing the relative amounts of beef, mutton and pork consumed in a few of the principal countries:

DISTRIBUTION OF ANNUAL PER CAPITA CONSUMPTION OF MEATS IN 1898.

	Beef lbs.	Mutton lbs.	Pork lbs.	Total lbs.
United Kingdom	63	32	35	130
France	43	10	26½	79½
Germany	43	3½	54½	101
Belgium	36	2½	31½	70

Only about one third of the beef consumed in Great Britain is produced there. It is a significant and striking fact that 25 years ago only one tenth of the meat used there was imported, and now the United States furnishes by far the greater part of their foreign meat, Argentina ranking second, and British North America third. Williams has conclusively shown that the importation of American and other foreign beef and mutton has materially reduced the London wholesale price of these meats. His statement is here reproduced:

Average wholesale price of beef in London markets:

1876-80 from 5¼d. to 8 d. per pound.
1895 from 2⅛d. to 6¼d. per pound.

Average wholesale price of mutton in London markets:

1876-80 from 7⅞d. to 9 d. per pound.
1895 from 2⅞d. to 7⅝d. per pound.

Since 1893 the imports of meat into Great Britain have nearly doubled. In 1893, 465,000 tons, and in 1910, 750,000 tons were imported. The annual per capita consumption of foreign meat in 1893 was 37½ pounds, while in 1910 it was 49 pounds. The total value of meat products exported from the United States in 1910 was $133,000,000. Meat production is one of the leading industries of the farms in Iowa, Illinois, Missouri, Indiana, and Ohio. In fact wherever corn thrives there we find meat production an important industry. Corn is undoubtedly more largely used in meat production than any other feed. The problem of economic meat production in the United States is largely a question of the best method of utilizing corn and its by-products. There is a gradual and apparently necessary and certain change, just beginning, which will have an important bearing upon beef production in the United States. With the closing of many ranges in the range country which have hitherto furnished a high percentage of stockers and feeders which have been finished on the corn belt, or at any rate, upon corn grown in the corn belt, the problem presents itself, where are cattle feeders to look for their future supply of feeding cattle? Everything points to the conclusion that ultimately more of the cattle fatted for the market on the high priced lands in the corn belt will be bred and reared there. In other words the entire process of beef production will necessarily be carried on by the majority of cattle men. As it is, about 85 per cent of the native beef cattle marketed in Chicago have been previously bought as feeders and finished by cattle feeders who do not breed or rear the cattle they feed. The tendency in meat production at present is to put live stock in marketable condition and market them at an earlier age. This system involves better bred animals, more liberal feeding and a large use of nitrogenous feeds.

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Mecca, mĕk'ạ, or **Makka**, Arabia, the holiest city of Islam, the capital of the province of Hedjaz, Asiatic Turkey, about 49 miles due east of Jiddah, its port on the Red Sea, with which it has telegraphic communication. The Mohammedans call it Umm-al-Kora, "Mother of Cities," and it derives its sanctity from having been the birthplace of Mohammed. The city stands in a narrow, sandy valley, enclosed by barren hills from 200 to 500 feet high, and is supplied with water from the mountains to the east by an aqueduct built in the 9th century, by Zubaidah, wife of Haroun-al-Raschid. The great mosque Beitu 'llah (House of God) or El-Haram (The Inviolable), enclosing the Caaba (q.v.), the Moslem "holy of holies," occupies a central square which divides the city into the northern upper, and the southern lower towns. The unpaved streets are wider than is usual in oriental towns, and the houses of stone, often three stories high, are lighted with windows looking on the street, giving them an occidental appearance. The stationary population is about 60,000, but the city is large enough for more than three times that number, and is annually filled at the time of the Hadj or pilgrimage to the Caaba, when apartments in almost every house are rented to strangers. This pilgrimage customary among the Arabs in early and idolatrous ages, and subsequently enjoined by Mohammed on all his followers, is the foundation of Mecca's fame, and the only source of the inhabitants wealth and occupation.

The Meccâwi, or inhabitants of Mecca, are, with the exception of a few Hedjâzi Bedouins, all strangers by birth or parentage. They are, in fact, settlers or children of settlers, attracted hither by the love of gain, and as they care nothing for learning, the colleges of Mecca have fallen to decay, and the libraries, once rich, have disappeared. Mecca during the pilgrimage becomes for three or four months in the year the greatest market in the East.

The pilgrims converge upon the holy city from three directions; those coming from the south are Mohammedans from Oceanica, Java, Sumatra, Indo-China, India, Turkestan, and southern Persia, who pass into the Red Sea through the Strait of Bab-el-Mandeb and on to Jiddah the port of Mecca; the northern branch of the pilgrims, north Persians, Turcomans and people from Asia Minor and European Turkey, go southward to the holy city both by the land and sea routes; the third stream is from the west, Egyptians, Moroccans, Algerians, Tunisians, and Turks, who reach Jiddah through the Suez Canal. For years past the average number of pilgrims passing through the Suez Canal to Jiddah has been 16,000, but this number is sometimes greatly exceeded; the number in 1901 was 26,000, and in 1902 was over 40,000. The northern pilgrims, however, are only a small part of those who annually convene at Mecca. The total number every year exceeds 100,000, practically all of whom are present at the fête of Bairam. The Sherîfs of Mecca, direct descendants of Mohammed, are now a numerous and widely spread body. They all wear the same costume, priding themselves on the green robe which marks their descent. These nobles, as they may be called, elect the Sherîf of Mecca, and their choice is formally confirmed by the Ottoman Sultan. Ptolemy mentions Mecca under the designation of Macoraba. The Wahabees took it in 1803; but in 1833 it was given up to Mehemet Ali, whose son Ibrahim was made Sheik el Haram.

Méchain, Pierre François, pē-ăr frăṅ-swă mā-shăṅ, French astronomer: b. Laon, France, 16 Aug. 1744; d. Castellon, Spain, 20 Sept. 1805. He became a mathematical tutor and devoted himself to the study of astronomy in his spare moments. In Paris he gained the interest of the astronomer Laland, who assisted him to a governmental position, in which he was engaged in the survey of the French coast and in astronomical observations. The Academy of Sciences elected him a member in 1782, and in 1785 he was editor of ‘Connaissances des Temps,’ in which appear some of his most valuable scientific papers. He was commissioned by the National Convention in 1791, in company with Delambre, to measure the arc of the meridian between Dunkirk and Barcelona. The results of the calculations made failed to satisfy him because of a slight discrepancy and though now appointed a director of the conservatory at Paris he persuaded the board of longitude to commission him to measure the arc between Dunkirk and the Balearic Isles, but died of fever in Spain while on his mission. See Delambre ‘Histoire de l'Astronomie au dix-huitième Siècle.’

Mechanical Cashier, The, an American invention, patented in 1902; a mechanical, automatic apparatus for shops and stores, that receives money, places it beyond the reach of the operator or salesman, records the transaction and the number of the operator who makes it, stamps the cash check with the amount, totalizes and makes change. At the top of the machine is a row of openings, through which the money is put into the machine, a separate opening of suitable size and shape being provided for each denomination of coin or bill. Mounted behind each opening is a wheel, around the circumference of which is a series of pockets which receive the money placed in the machine. Each pocket takes but one coin or bill. Below each opening is a lever appropriately marked. When money is put into a pocket, the corresponding lever is pushed down. The wheel devoted to this particular denomination revolves sufficiently to bring the pocket below (which is always empty), in position behind the opening, the pocket containing the money being no longer accessible to the operator. Over the wheels is a glass cover which allows the contents of the pockets to be readily seen, and the amount of the purchase is registered on the keyboard. The sales ticket is slipped into the machine, and the operator turns the handle at the side, whereupon, simultaneously and automatically, it follows that (1) the exact amount of change is delivered from the machine; (2) the particulars of the sale are printed on three different parts of the sales ticket, and one part of it is clipped off and deposited in a locked drawer; (3) the particulars of the sale are also printed on a record tape within the machine; (4) the amount of the sale is included within a total, recorded by dials in front of the machine; (5) the depressed keys are returned to their normal position. While the functions which the machine performs are themselves complicated, the mechanism itself consists of the simplest mechanical movements, and no ordinary use of the machine can impair the perfection with which all of its parts operate. All parts of the machine are locked until a key is inserted, so that a clerk cannot operate it without the machine recording his number, and no one, not provided with a key, can tamper with the machine, or disturb its contents.

Mechanical Movements and Appliances. All mechanical appliances and devices employed to convert power into motion, or to transmit that motion from one point to another for mechanical purposes are technically designated «mechanical movements.» For example — the mechanism of a watch, consisting of springs which supply the power or motive energy, and the wheels which transmit that power in a regulated manner to move the hands around the dial plate, is termed the «movement» of the watch.

Mechanical motion is either simple or compound. Simple motions are of three kinds: (1) «straight translation,» (2) «simple rotation,» and (3) «helical.» All of them may be continuous or reciprocating accordingly as their duration is definite or indefinite, respectively; while continuous motion may also be uniform, or it may be accelerated. Oscillatory motion is reciprocating simple rotation, while helical motion of indefinite duration is always reciprocating.

«Compound motions» are obtained by combining any two or more of the simple motions, and are usually referred to under the name of the particular device employed, or according to the method of its application.

«Pendulum motion» is the oscillatory motion of a body in the arc of a circle, the body being attached to a rod which vibrates to and fro from a fixed axis. In the ideal simple pendulum consisting of a body attached to a string without weight, and vibrating from the point of suspension without resistance of any kind whatever, a material body once set in motion would continue to vibrate to and fro forever, since the tension of the string, like the resistance of the plane, will always be equal to one component of the weight, and in both cases will be exerted at right angles to the direction of motion, and, therefore, will not affect the velocity of the body.

Under these conditions it has been noted (1) that the time of a vibration of a pendulum through short arcs is independent of the lengths of the arcs, and that when the length of the arc is constant, as in the case of clock devices, the times of vibration are equal; (2) that when the force of gravity is constant, as is the case at any given point on the surface of the earth, the time of vibration varies directly as the square root of the length of the pendulum, so that, if a pendulum of a given length vibrates in one second, a pendulum one quarter as long will vibrate in ½ second, and one four times as long will vibrate in 2 seconds; (3) that when the length of the pendulum is constant, the time of a vibration varies inversely as the square root of the force of gravity; and (4) that when the time of vibration of two pendulums at different points on the surface of the earth is equal, their lengths vary directly as the force of gravity.

While these relations give direct methods for determining the proper lengths of pendulums for clocks at different stations, and for comparing the values of the force of gravity at different latitudes, or at different heights above sea-level, the practical utilization of pendulum motion is always by means of some form of «compound pendulum,» which, on account of its mechanical construction, consists of an indefinite number of particles of material which are joined together rigidly, and vibrate from a fixed axis, and the length of such a pendulum is equal to the length of a simple pendulum which would vibrate in the same time. This length is found by determining the distance between the «axis of oscillation» and the «axis of suspension» of the pendulum. See special article on PENDULUM.

«Perpetual motion» is a continuous or incessant motion supposed to be attainable by a mechanical device with inherent motive energy, and therefore, which when once set in motion is capable of continuing that motion indefinitely or perpetually. Such a device or machine, if practicable, might be termed a «perpetual movement.»

Mechanical force is derived from natural sources by prime motors or generators such as steam, gas, and hydraulic engines, water-wheels, windmills, dynamos, and storage batteries, and is used to perform mechanical work by transmission and application, by machines consisting of mechanical movements embodying the principles of the so called «mechanical powers,» namely, (1) the «lever»; (2) «wheel and axle»; (3) «toothed wheels» or «wheel gearing»; (4) «pulley»; (5) «inclined plane»; (6) «wedge»; and (7) «screw.» Of these, the wheel and axle and the various systems of wheel gearing are simply modifications of the lever, and the wedge and the screw are modifications of the inclined plane; while the action of the pulley is based upon the prime principle of reduplication, which depends on the fact, that when transmitting a force the tension of a string or rope is the same at every point. See special articles in this encyclopedia under the respective headings.

By means of such movements, the machines of which they form a part are enabled to transmit or to transform mechanical force and apply it with a certain amount of mechanical advantage. By transmission, a force applied at one point is made to act at another with a change in its direction, if necessary. By transformation, a force may be changed in its intensity so as to raise a weight much greater than that of the machine, or it may be employed to impart to the weight a greater velocity than that of the force itself. It is to be clearly understood, however, that machines cannot create force — they are merely the means by which force is utilized.

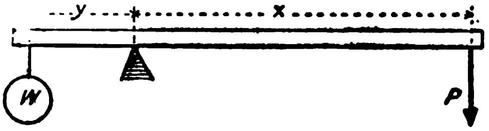
Under the laws of statics the work performed by a machine is estimated by the height to which a weight is raised, or the amount of resistance overcome in a definite distance. This relation may be expressed by the proportion — «the force is to the weight or resistance as the distance through which the weight is raised or the resistance is overcome, is to the distance through which the force acts.»

Machines, therefore, may be applied in three ways: (1) where a small force is applied to lift a large weight, or to overcome a great resistance; this represents a mechanical advantage — a gain of power with a loss of velocity; (2) where an increase in the velocity is required, and represents a mechanical disadvantage — increase of velocity being gained at the expense of power; (3) where only the transmission of the force from one point to another, or a change in its direction is required, in which case the force is equal to the weight or resistance, and the appliance is merely convenient.

These relations of the power and weight, or resistance, exist under the assumption that the machines are frictionless, and that all the power is expended in raising the weight or in overcoming the resistance with, theoretically, no limit to the mechanical advantage that may be gained by the use of machines made up of suitable combinations of movements; but, practically, there are other resistances, due to the weight of the various parts of the machine and the important element of friction, which use up a portion of the power so that the actual amount of work done by a machine is somewhat less than the amount theoretically expected of it. The ratio of the actual to the theoretical amount of work performed by a machine is its «modulus» or efficiency, and to increase this efficiency is the direct object of the use of a particular mechanical movement, rather than some other, in the construction of a machine. A simple but very comprehensive example is afforded by the various forms of water lifts. The mechanical advantage gained by the use of the modern force pump over the older form of windlass, and the primitive bucket and rope, or bucket and hook-pole.

is too clear to require an elaborate analysis.

Movements embodying the principle of the lever are of three classes: (1) those in which the fulcrum is situated between the power and the weight; (2) those in which the fulcrum is at one end of the lever arm with the weight nearer to it than the power; and (3) those in which the fulcrum is at the end with the power nearer to it than the weight.

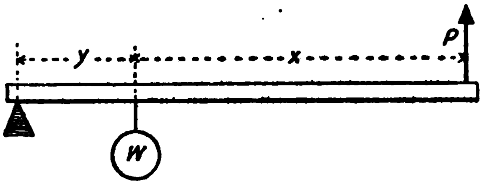


Lever of the first order.

$$P=\frac{W\times y}{x},\quad W=\frac{P\times x}{y},$$

In the first, if the weight is nearer to the fulcrum, there is a mechanical advantage — illustrated by the crowbar, which on account of the great difference in the length of its arms, is advantageously used to overcome great resistances. Scissors and nippers are double levers of this class. If the power is nearer to the fulcrum, there is a mechanical disadvantage, and if the weight and the power are at an equal distance on either side of the fulcrum, the power is equal to the weight and gives an arrangement similar to the ordinary balance.

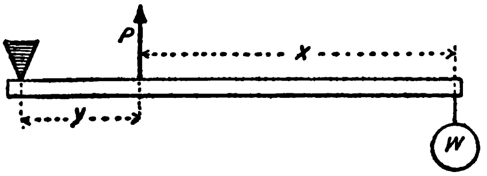
The distinction between the gain of power and the loss of velocity, and the reverse of these conditions, as depending upon the position of the fulcrum, is exemplified by the shears used for cutting metal, and those used for cutting cloth, respectively. In the former, short blades with long handles overcome a great resistance slowly; while in the latter, long blades operated by short handles, move quickly.



Lever of the second order.

$$P=\frac{W\times y}{(y+x)},\quad W=\frac{P\times\overline{(y+x)}}{y}$$

In the second class there is always a mechanical advantage. The wheelbarrow is an example of the single lever. The fulcrum is at the centre of the wheel, the weight acts downward at the centre of gravity of the load, and the power is applied at the ends of the handles. A hinged nut-cracker is an example of a double lever of this kind.



Lever of the third order.

$$P=\frac{W\times\overline{(y+x)}}{y},\quad W=\frac{P\times y}{x+y}$$

In the third class there is always a mechanical disadvantage; but, great rapidity of movement is obtained. The human forearm is an example of a single lever of this class. The fulcrum is at the elbow-joint, the weight acts downward at the hand, and the power is applied obliquely by a tendon from the biceps muscle attached near the elbow. A pair of tongs is an example of a double lever of this class.

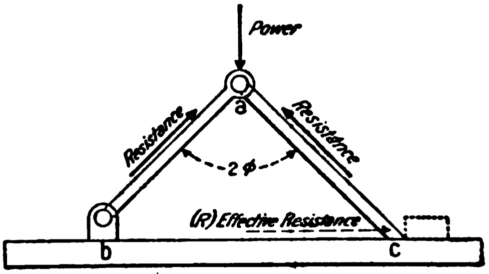


Fig. 1.— Toggle-Joint.

$$\frac{\text{Power}}{R}=\frac{2}{\tan.\phi}$$

In the toggle-joint, a movement composed of two levers hinged together at (*a*) Fig. 1, with the end at (*b*) free to turn on a fixed pivot, while the end at (*c*) is free to move in the direction (*ac*), there is a great mechanical advantage especially when the levers are nearly in a straight line. It is frequently employed for raising the covers of carriages, and also with great efficiency in stone crushing machinery. (For other examples of lever movements see articles in this encyclopedia under the titles — BALANCE, TESTING MACHINES, WATCH, and WEIGHING MACHINES.

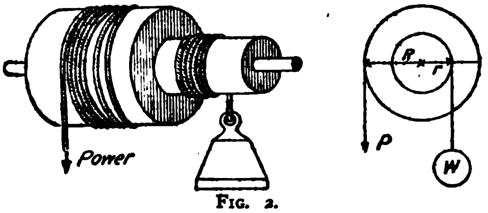


Fig. 2.

$$\frac{\text{Power}}{W}=\frac{r}{R}$$

The wheel and axle consists of two cylinders of different sizes rigidly connected together and turning about a common axis. The larger cylinder is called the wheel and the smaller the axle. The power is applied to the end of a rope wound around the wheel and the weight is raised by a rope wound around the axle, see Fig. 2. It is essentially a form of lever, and «the power is to the weight lifted as the radius of the axle is to the radius of the wheel.» The principle is applicable to all forms of hoisting machines, steering gear of ships, fusee clock and watch movements, etc. The differential or «Chinese» windlass employs two axles of different diameters, see Fig. 3. A rope passing under a *movable* pulley is wound around the large axle, and unwound around the smaller, so that the upward movement of the weight supported by the pulley is very slow, and therefore, the mechanical advantage very great.

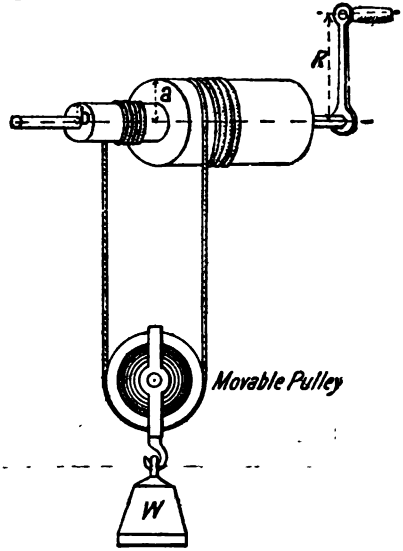


FIG. 3.

$$\frac{\text{Power}}{W}=\frac{a-b}{2R}$$

Wheel gearing consists of trains of two or more gear wheels the teeth of which interlock so that a force applied to one is communicated to the others. With a loss of speed there is a mechanical advantage, but a gain in velocity is at the expense of power, and constitutes a mechanical disadvantage. As a rule, «the moment of the power is to the moment of the weight as the number of teeth in the power wheel is to the number of teeth in the weight wheel.»

Trains of toothed wheels are employed in derricks and cranes for lifting heavy weights, and in the back-gears of large turning lathes where a gain in power is required. They are also used extensively in the works of clocks and watches, but in such cases the relation of the power to the weight is not considered since the desideratum is the relative velocity of the axes of the successive wheels. The rack and pinion movement consists of a straight toothed-bar the teeth of which interlock with the teeth of a gear wheel which when turned by a handle or screw-head moves the bar up and down, or back and forth. A familiar example is the arrangement usually employed to move the tube of a microscope up and down.

The axial motions of wheels may be communicated to each other by belts as well as by gear wheels, with or without a change of velocity. Their operation depends upon the friction of the contact surfaces, and the velocities of the two axes are in inverse ratio of the radii of the wheels, while the mechanical advantage is the direct ratio as in the case of gear wheels.

In the case of the cone-pulley, Fig. 4: when the belt passes over the smallest wheel of the lathe shaft and over the largest wheel of the power shaft, the velocity of the axis of the lathe will be the greatest and its power to overcome resistance the least while a reversal of the belt arrangement just stated will give exactly the opposite results in the movement and power of the lathe. For other applications of the principle see special article entitled WHEEL GEARING.

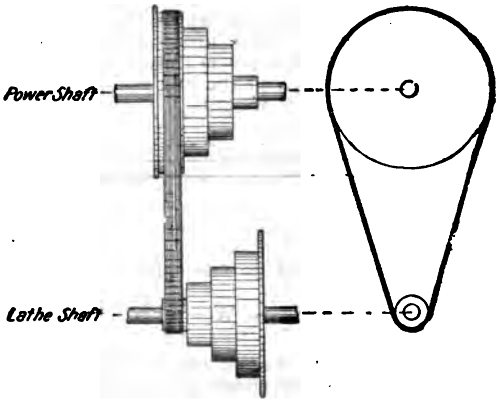


FIG. 4.

The pulley, another modification of the lever, gives a mechanical advantage under certain conditions. (See special article entitled PULLEY.) Although the theoretical relation of the power to the weight is not attained in practice since serious resistances due to friction and to the stiffness of the ropes have to be overcome, it is a very useful mechanical appliance and is extensively employed in connection with the wheel and axle, or with gear wheels, in the machinery of derricks and cranes, and also forms an important part of a ship's rigging.

The inclined plane is simply a rigid plane inclined to the horizon at an angle, and upon which a weight may be supported by a force acting in a definite direction. (See special article entitled INCLINED PLANE.) The relation of power to weight depends upon the direction of action of the supporting force. When the force acts along the plane, «the power is to the weight as the height of the plane is to its length.» When the force acts horizontally, «the power is to the weight as the height of the plane is to the base.» The principle is applied in arrangements by which boxes and barrels are pushed up from the ground and loaded on wagons, cars, etc. It was probably applied in the machinery employed to handle the great blocks used in the building of the Egyptian pyramids. It is more familiarly exemplified in the case of any mountain highway, or that of an up-grade railroad. It is to be clearly understood, however, that the use of the principle does not diminish the amount of work to be performed since that amount remains the same for a given vertical height at any angle of inclination. See Fig. 5.

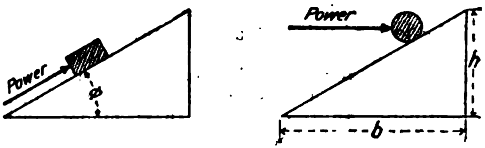


FIG. 5.

Sliding Weight.

$$P=(W\times\sin\phi)+\text{friction}$$

Rolling Weight.

$$P=\frac{W\times h}{b}$$

The wedge, sometimes considered as a combination of two inclined planes placed base to base, consists of a five-sided solid. The two adjacent sides which meet in the edge are rectangles, the two opposite sides are triangles, and the back is a rectangle. Fig. 6. The power acts in a direction perpendicular to the back, and the resistances are felt in the same plane perpendicular to the sides. Under these conditions the mechanical advantage increases as the angle of the wedge decreases — "the power being equal to twice the resistance into the sine of the angle of the wedge." This relation, however, has but little practical value since the resistance due to the friction is very great. The principle is used in many forms of cutting tools such as the knife, chisel, axe, and plane. For working in comparatively soft materials, the angle is kept small and the edge sharp; but, for harder materials the angle is increased. Metal planing tools have very large angles, ranging from 60° to 80°. When the wedge is employed for cleaving wood, the cohesion and friction combined produces so great a resistance that the force is applied in the form of a blow from a heavy body, and the resulting strain is equal to the force of the blow multiplied by the length of the wedge divided by its width. See special article entitled WEDGE.

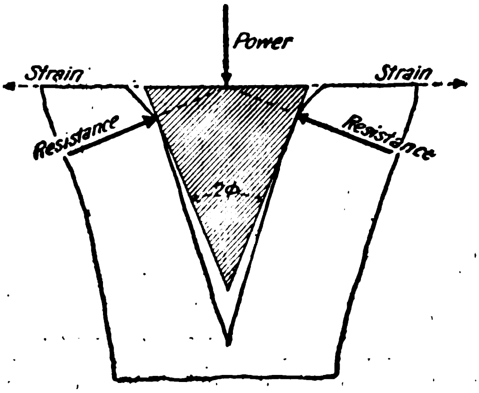


FIG. 6.

$$P = 2R \sin \phi$$

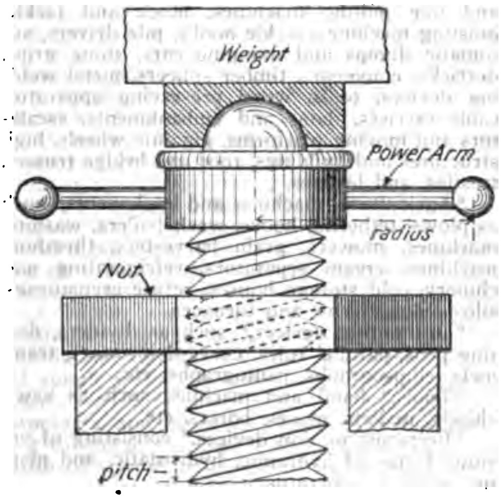


FIG. 7.

$$P = \frac{W \times \text{pitch}}{2 \times \text{radius} \times 3.1416}$$

The screw is essentially an inclined plane wound spirally around a cylinder, in the form of a rectangular or a triangular shaped groove. Fig. 7. When used, it works in a nut the parts of which are complementary to and fit into those of the screw. Either the nut or the screw may be made stationary. The power is applied to a lever arm at the end of the screw, its direction of action being at right angles to the axis of the screw, and therefore, imparting to it a turning motion which is, however, transformed by the resistance between the screw and the nut into a forward rectilinear motion parallel to the axis. Since this resistance is felt at every point of contact between the screw and the nut perpendicularly to their common surface, "the power is to the weight as the distance between the threads is to the circumference described by the power." The principle is applicable to many machines used to raise great weights, or to exert heavy pressures. Jack-screws for raising buildings, and screw presses used for various purposes, are familiar examples. (For examples of the application of the principle in the propelling of ships, see article entitled SCREW PROPELLER, and for examples of its application in water lifts, see special article entitled PUMPS AND PUMPING MACHINERY, and also special article entitled SCREW.) Theoretically, the amount of mechanical advantage that may be gained by increasing the length of the lever arm, or by decreasing the distance between the threads, is unlimited; but, practically, the element of friction reduces the amount of the advantage to such an extent that the efficiency of the simple screw is small. A much greater mechanical advantage is obtained from the "differential screw." In this form, a large screw turns in a fixed nut, and a smaller screw of lesser pitch turns within it. The power is applied to the large screw and the resistance is felt by the smaller, so that while the larger descends, the smaller ascends, and the actual motion of the object moved is the resultant of these two opposite velocities, and slower than that obtainable from the simple form. Fig. 8 shows a differential movement in which a screw (a) works in a nut (f) fixed to the wheel (b) but turning freely in a bearing (g) in the Standard (c) which prevents any lateral motion. The screw shaft is fixed to the wheel (d). The driving shaft (h) carries the pinions (k) and (m) which drive the wheels (d) and (b) at

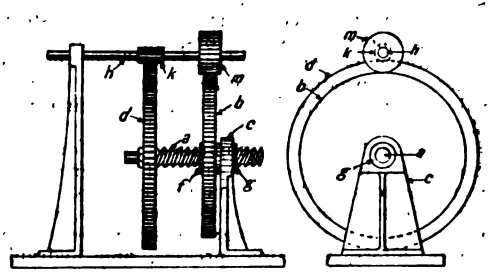


FIG. 8.

unequal velocities so that the screw travels according to the difference of velocity. For working purposes, "the power is to the weight as the difference of the distances between the threads of the two screws is to the circumference described by the lever arm. For example of endless screw, see *Worm-gearing* in article entitled WHEEL GEARING.

The principle is advantageously applied to instruments used for making minute measurements. In the "micrometer screw" used for this purpose, the relation in the velocity of motion of the parts is the point considered, and not that of the power to the weight. For example: Suppose a screw is grooved with 100 threads to the inch, and that the circumference of the circle constituting its head is graduated into 100 parts. It is obvious that one complete revolution of the screw would advance one one-hundredths of an inch, and that if the head of the screw was equipped with a fixed index so that it could be turned through one one-hundredths of a revolution, the advance of the screw would be one ten-thousandths of an inch — the smallest interval measurable by that particular arrangement. Such screws with very fine threads, and therefore of very slow motion, are used as measuring devices, directly or indirectly, in many forms of physical apparatus.

The various forms of mechanical movements embodying the principles of one or more of the mechanical powers already described are so innumerable that a detailed description of them is impracticable within the scope of this article; but they are classified as follows into several important groups according to the general purposes for which they are used.

"Transmission of power appliances," consisting of ropes, belts, and various forms of gears, pulleys, etc.

"Measurement of power appliances and devices," used for determining velocities, pressures, weights, number, and quantities, such as brakes, counters, dynamometers, gauges, indicators, meters, planimeters, testing machines, and weighing machines.

"Steam power appliances," comprising boilers, locomotives, locomotive engines, oscillating engines, rotary engines, steam engines, steam turbines, valves and valve-gears, parallel motion gears, governors, and other engine devices.

"Steam appliances," such as injectors, steam pumps, condensers, separators, traps, and valves.

"Motive power machines," such as gas engines, gas producer engines, gasoline engines, valve-gear and appliances, and connecting rods and heads.

"Hydraulic power appliances and devices," consisting of various forms of water-wheels, water-motors, turbines, pumps, syphons, water-lifts, ejectors, hydraulic or water rams, meters, indicators, pressure regulators, valves, pipe joints, filters, hydraulic presses, and hydraulic metal working machinery such as riveters, rail benders, and punches.

"Air power appliances," devices and apparatus consisting of air compressors, air pumps, air water-lifts, barometers, bellows, blowers, blowpipes, and compressed-air tools such as pneumatic drills, hammers, riveters, and shearing machines. Also, gauges, ventilators, and musical instruments.

"Electric power and construction appliances" such as generators, motors, wiring devices, controling and measuring devices, lighting arrangements, electric furnaces, heaters, fans, searchlights, and drilling machines.

"Navigation appliances" used for operating steamships, sailing vessels, and yachts, such as sails, rope knots, block and tackle, paddle wheels, screw propellers, steering gear, anchors, windlasses, capstans, cranes, etc.

"Road appliances," used in the construction of roads, highways, and railroads, such as scrapers, rollers, excavators, vehicles, motor carriages, bicycles, tricycles, motor adjuncts, wheels, road gates, lamps, etc.

"Gearing," consisting of rack and pinion devices, spiral, elliptical, and worm gears, differential and stop-motion gears, and epicyclical and planetary trains.

"Motion and controlling devices," consisting of ratchets and pawls, cams, and volute cams, cranks and variable cranks, intermittent and stop motions, wipers, shafts, couplings, and gyroscopes.

"Horological apparatus and devices," mainly used for measuring time, such as spring and pendulum clocks, watch and chronometer movements, electric clocks, and sundials.

"Mining machinery and appliances," such as quarrying and cutting machines, borers, drills, valves, blowers, ventilators, safety lamps, hoisting drums, conveyors, crushers, pulverizers, hydraulic nozzles, presses, air-blast and magnetic separators, steam shovels, dredges, haulage appliances, furnaces, and automatic dumps.

"Mill and factory appliances," such as hangers, shaft bearings, ball bearings, steps, couplings, universal and flexible couplings, speed gears, shop tools, screw threads, hoists, stampmills, saws, punches, shears, bending machines, grinding machines, cotton presses, looms, knitting machines, etc.

"Engineering construction appliances," such as mixing machines, testing machines, stump and pile pulling machines, block and tackle, hoisting machines, tackle hooks, pile drivers, automatic dumps and dumping cars, stone grips, derricks, conveyors, timber splicers, metal welding devices, tools, wood preserving apparatus, cable carriers, dams and embankments, escalators and moving platforms, gigantic wheels, high structures and buildings, roof and bridge trusses, trestles, and bridges.

"Agricultural machines and implements," such as plows, tethering hooks, wash boilers, washing machines, mowers, grain harvesters, threshing machines, cream separators, refrigerating machinery, cold storage houses, refuse crematories silos, kilns, ovens, and furnaces.

"Draughting devices," such as dividers, dotting pens, parallel rules, curve delineators, tram mels, ellipsographs, pantographs, etc.

"Tools," hand and machine, such as saws, chisels, mallets, planes, borers, etc.

"Perpetual motion devices," consisting of various forms of hydraulic, hydrostatic, and magneto-electric apparatus.

Bibliography.—For descriptions of a great variety of special movements, appliances, and devices, consult the works on the subject by Hiscock, Rheile, Ruleau, and Spon, also the special articles on the various forms of appliances enumerated under the general classes stated in this article.

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Mechanical Terms. Words, compound words, and short phrases, having definite meanings other than those of ordinary usage, and specifically applicable to the use of tools and other mechanical appliances; to the construction and operation of machines; and to the methods employed and the manipulations required in the working and manufacture of the various kinds of materials used and the articles employed for engineering, structural, and other industrial purposes.

A great many of these terms have been in use from the very beginning of the present period of industrial and manufacturing development, and are satisfactorily employed at the present time according to their original significance; but the creative mechanical effort of the last 25 years has either developed or produced so great a variety of mechanical devices and machines that the mechanical terminology has been expanded to include a much greater number of terms, which are more or less unfamiliar to every one excepting those by whom they are habitually used in the execution of the particular line of work to which they are applicable.

Furthermore, the specializing methods of modern manufacturing systems, involving the restricted use of special terms, has not only tended to develop a class of one-sided workmen who are unquestionably skillful in their special lines of work and deplorably poor if not absolutely deficient in all other lines; but, the use of such methods has tended to increase the ever-widening gulf which separates any one class of workmen from the rest, by eliminating the necessity of a mutual knowledge of the special terms used in allied processes, by the special classes of workmen employed therein.

At the present time the number of mechanical terms amounts to several thousands. Eliminating those of a more or less fanciful character, and also those employed in individual shops, the terms having definite meanings capable of universal or wide application probably exceed 12,000 in number, the great majority of which are employed in the metal manufacturing and metal working industries.

A superficial examination of this terminology conveys the impression that a definite classification of the various terms would be either impossible or quite difficult, but a closer inspection shows that they may be very conveniently divided into several general classes according to the character of the work, machines, and structures to which they are applicable, as follows: (1) Terms applicable to the processes and methods employed in the production of raw materials and rough work, and in the preparation of rough work for subsequent finishing operations; (2) Terms applicable to the methods, processes, and machines employed in the working of suitably prepared raw material into the form of simple articles, into the parts of complex machines, and into structural shapes in general; (3) Terms employed in the work connected with the preliminary and final erection of machines, engines, and structures; (4) Terms used for the purpose of describing special forms of mechanical appliances and mechanical movements according to their field of application; (5) Terms employed in operating the various classes of engines and machines; (6) General terms employed in connection with the execution of mechanical and structural engineering work; and (7) Terms employed in connection with the use of the tools and appliances, and the application of the various methods and processes, in the reproductive arts.

In considering the matter of the application of technical terminology, it is well to prescribe marked lines of demarcation between the terms employed in connection with the different kinds of work, as for example — between the terms applicable to mechanical work and those employed in connection with electrical work. As a rule, the distinction is quite clear, but when the terms are used for the purpose of describing appliances, devices, and apparatus, the line of demarcation becomes somewhat indistinct, and the precise meanings of the terms require careful consideration.

One of the most interesting examples of the varied technical application of a common term is that afforded by the use of the word «damper.» It is familiarly known as a plate, valve, cover, or other suitable contrivance for regulating the amount of draught in the flues of a furnace or boiler. As a specific mechanical term it is applied to the «dash-pot» or small cylinder which forms a portion of the engines of the Corliss type, in which they act as a «buffer-case» and prevent the too sudden closing of the steam and exhaust valves. As an electrical term it is applied to a metallic cylinder which is placed in such a manner that it nearly or entirely encompasses the iron core of an induction coil for the purpose of effecting a variation in the intensity of the current produced in the secondary battery. As a term employed in musical construction and operation, it is applied to the strip of felt or other soft material employed in a pianoforte for the purpose of modulating the vibration of the strings.

A more varied technical application obtains in the case of the common word «pitch.» As used in connection with mechanical work it refers to the distance between the centres of two adjacent teeth on a gear-wheel, to the distances between bolts, rivets, and boiler stays, or similar parts arranged equidistantly. Also, to the inclination or rake of the teeth of saws, to the angle at which a plane-iron is set in its stock, and to the height or angle of a roof-truss. As an electrical term it refers to the successive corresponding conductors on the armature of a dynamo and the number of coils advanced in making end-connections between the coils of an armature winding divided into segments. It is also applied to designate the frequency of a tone vibration produced electrically. As a musical term it refers to a succession of tone vibrations.

The character of a technical term or the class of work to which it belongs is usually very clearly indicated by the textual matter on any particular subject, but in the case of mechanical and electrical terms when the distinction is not obvious, the special character of a term may be ascertained only by the nature of the power generated, controlled, or applied.

For further information consult articles under the titles BOILER SHOP TERMS; FOUNDRY AND FORGE SHOP TERMS; ENGINE; ENGINEERING AND STRUCTURAL TERMS; ELECTRICAL TERMS; LOCOMOTIVE, DESIGN AND CONSTRUCTION OF THE MODERN; STEAM ENGINE TERMS; TOOLS; VALVES AND VALVE TERMS; and WORKSHOP TERMS; in this Encyclopedia.

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Mechanics (*μηχανή*, a machine), or DYNAMICS, the science that treats of forces (*δύναμις*, force), and of the motions produced by them. The notion of a force, as evinced to the senses as a push or pull, is common to all, but the notion of force as that which produces or destroys motion, which is the proper definition of force, is modern, and is to be ascribed to Newton, the chief founder of the science. It is a familiar fact that two opposite pushes or pulls may neutralize each other's effects, and thus fail to produce motion, we then speak of them as forces in *equilibrium*. The portion of Mechanics that treats of forces in equilibrium is denoted by the term *Statics* (root *στα*, stand), contrasted with which we have the subject of *Kinetics* (*κινέω*, to set moving), which deals with the effects of forces in acting to produce motion in bodies. Since we can distinguish motion only in matter, the laws of motion involve the essential properties of matter, so that Dynamics is a branch of Physics—indeed, its most fundamental branch, for it is the effort of physicists to reduce all explanations of physical phenomena to descriptions of matter in motion.* Nevertheless, as in geometry, instead of dealing with actual substance, we make abstraction and conceive of points, lines, and surfaces apart from the substance in which they lie, so we may make abstraction and consider the motion of points, lines, or geometrical configurations, quite apart from any matter or physical properties. This geometry of moving configurations or geometry of space and time is generally distinguished by the name of *Kinematics* (*κίνημα*, motion), and is included under treatments of Dynamics only for convenience, as it is impossible to make dynamical investigations except in kinematical terms.

The ancients knew but little of Mechanics, and what they did know belonged exclusively to Statics. Archimedes was familiar with the principle of the lever and of the pulley. Leonardo da Vinci generalized the principle of the lever, and Stevinus (1548–1620) demonstrated the principle of the inclined plane and of the composition of forces. Varignon clearly enunciated the principle of moments, and also of the composition of forces. Galileo, in the course of his investigations on the inclined plane, came to a recognition of a particular case of the Principle of Virtual Work, which was made general by Daniel Bernoulli. These are the chief names in the development of Statics. The beginnings of Kinematics were made by Galileo, who determined the laws of falling bodies, and introduced the fundamental idea of acceleration. Huygens, in his 'Horologium Oscillatorium,' published in 1673, examined in detail the laws of the pendulum, introduced the ideas of moment of inertia, of the center of oscillation, and of kinetic energy. Most important of all was the work of Newton, who in his 'Principia Philosophiæ Naturalis' (1687) not only universalized the idea of force, and introduced the notion of *mass*, but laid down the exact definitions and principles from which it has never been necessary to depart. Since the work of Newton the chief names have been d'Alembert, Lagrange, and Hamilton, who have given us methods of great generality and convenience, but without changing in any essential the principles laid down by Newton.

1. STATICS.—Although the principles of Statics may be logically deduced from those of Kinetics by assuming all velocities to be zero, it is simpler to follow the historical method and treat statics first, since we may dispense with the idea of time, and thus with the preliminary study of kinematics. We begin by assuming the identical nature of all forces. For instance, the effect of any force may be neutralized by a pull on a string fastened to the point at which the force is applied. The tension on a string is produced by equal and opposite pulls on its two ends, and it may be cut anywhere, if at the cut end is applied a force equal to the one previously applied to the end. Such a force may be produced by the weight of any body hanging from the end of the string. But as a weight always acts vertically downward, while forces may act in any direction, we may suppose the string carried over a smooth pulley with horizontal axis, whose effect is assumed to be merely to change the direction of the string without changing its tension. Thus any force in any direction may be equilibrated by the tension of a string produced by a certain weight. Two forces are equal when they are equilibrated by the same weight. Two weights found to be equal (by equilibration), when hung from the same string, produce double the tension produced by one, and thus forces may be measured in terms of a single weight. A force having magnitude and direction, may be geometrically represented by a line, parallel to it, and of a length proportional to its magnitude. To this line an arrow-head may be attached to indicate the sense of the direction of the force. We may now enunciate the principle, capable of experimental verification, that when two forces, represented by AB, AC, Fig. 1, are applied at the same material point A, they may be replaced by a single force whose direction and magnitude are represented by the diagonal AD of the parallelogram formed on the sides AB, AC. (The direction of the arrows must be observed.) This is the principle of the *Parallelogram of Forces*. Obviously it may be replaced by the equivalent statement that if we form a triangle by placing at the extremity B of one of the lines representing the forces the initial point of the line representing the other force, BD, and complete the triangle, the line drawn from the initial point of the first to the terminal point of the second line will represent the *resultant* of the two forces, that being the term applied to the single force which replaces their effect. The original forces AB, AC, are said to be the *components* of AD. From the properties of the parallelogram, $AB \sin (BAD) = AC \sin (CAD)$, so that the magnitudes of the components are inversely proportional to the sines of the angles they make with the resultant. Obviously the

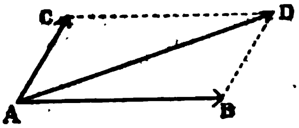

FIG. 1.

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* *Utinam cætera naturæ phænomena ex principiis mechanicis eodem argumentandi genere derivare liceret.* Newton, Preface to Principia.

two forces may be equilibrated by a force equal but opposite to the resultant, so that if we draw AE equal and opposite to AD (Fig. 2) the three

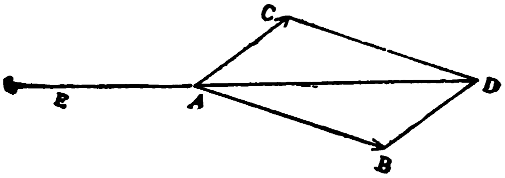

Fig. 2.

forces AB, AC, AE will be in equilibrium. As the angles BAD and BAE are supplementary, their sines are equal, similarly DAC and CAE; consequently we have $\frac{AB}{\sin(CAE)} = \frac{AC}{\sin(BAE)}$, and in turn considering each of the three forces as equilibrating the other two we get the theorem that the magnitudes of three forces in equilibrium are proportional to the sines of the angles lying opposite them respectively. This may be experimentally verified as in Fig. 3, where weights P, Q are hung

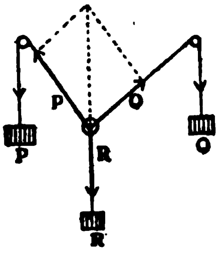

Fig. 3.

from strings passing over pulleys, and united at O to a string carrying a weight R. If a parallelogram be drawn on lengths proportional to P, Q, its diagonal will be vertical, and proportional to the weight R. A convenient form of the experiment is one in which the three strings are horizontal, and O is the center of a horizontal circular table, on whose rim the three pulleys may be placed, their relative positions being read off on a graduation of the edge of the table.

Obviously, by a reversal of the previous process, a given force may be resolved into components in any two given directions, as only one parallelogram can be drawn on a given diagonal, whose sides have given directions. If these directions are at right angles to each

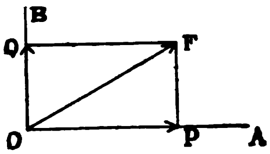

Fig. 4.

other, as in Fig. 4, OP is the *component* of OF in the direction OA, and OQ the component in the direction perpendicular thereto. The length OP is called the *projection* of OF in the direction OA, and we have $OP = OF \cos(POF)$. Having found the resultant of two forces applied at a common point, we may compound this resultant with another force, and so on, the simplest rule of procedure being by an extension of the triangle method above, that is, apply the initial point of each line representing a force to the terminal point of the preceding line; then the line drawn from the first initial point to the last terminal point will represent the resultant. The slightest consideration will show that the resultant is independent of the order in which the forces are compounded. This construction is known as the polygon of forces (Fig. 5). It is ob-

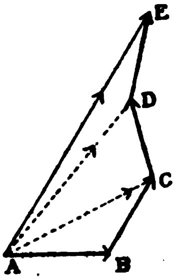

Fig. 5.

viously not restricted to forces lying in the same plane.

In order to deal analytically with the composition of forces, it is convenient to assume three rectangular axes of coordinates, OX, OY, OZ (Fig. 6), and to resolve every force into

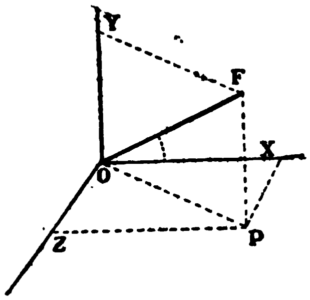

Fig. 6.

three components along each. Thus OF may be resolved into the mutually perpendicular components OY and OP, and OP may be resolved into OX and OZ. Calling the resultant F, the components respectively X, Y, Z, we have

$$(1)\qquad \begin{aligned} X &= F\cos(Fx),\\ Y &= F\cos(Fy),\\ Z &= F\cos(Fz); \end{aligned}$$

$$(2)\qquad X^2+Y^2+Z^2 = F^2\left[\cos^2(Fx)+\cos^2(Fy)+\cos^2(Fz)\right] = F^2,$$

since the sum of the squares of the direction cosines of any line is identically equal to unity. Since the projection in any direction of any broken line is the same as that of a straight line with the same ends, it is evident that the projection of any resultant is the same as the algebraic sum of the projections of all its components. Thus the analytical expression of the principle of the parallelogram or polygon of forces is, if F is the resultant, X, Y, Z its components along the axes,

$$\begin{aligned} X &= X_1 + X_2 + \ldots X_n = \Sigma X, \\ Y &= Y_1 + Y_2 + \ldots Y_n = \Sigma Y, \qquad (3) \\ Z &= Z_1 + Z_2 + \ldots Z_n = \Sigma Z. \end{aligned}$$

Any geometrical or physical quantity which possesses direction as well as magnitude, and is compounded according to the parallelogram law, and to which the whole of the above exposition applies, is called a *vector*, and the preceding process is called the *composition of vectors*.

2. A body so small that we may neglect the differences of position of its different points is called a *material particle*. The only principle necessary for the treatment of forces acting on such a particle is that for equilibrium the resultant of all the forces applied to it must vanish. The particle may be free or it may be subject to certain geometrical constraints, for instance, it may be obliged to move on a certain surface. Then there will be certain forces acting between the particle and the bodies causing the constraint, these forces being known as *reactions* due to the constraint. A surface is said to be smooth if the reaction between it and a particle is normal to the surface. Thus let F, Fig. 7, represent a force applied to a particle of weight W, resting on an inclined plane making an angle α with the horizontal. Let F be parallel to the inclined plane. Then the three forces, W, F, and R, the reaction, normal to the plane, are in equilibrium. Writing these proportional to the opposite angles, as above, we obtain

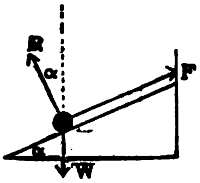

FIG. 7.

$$\frac{F}{\sin\alpha} = \frac{R}{\cos\alpha} = \frac{W}{1}, \qquad (4)$$

which determine F and R in terms of W. The same equations are obtained by resolving in the direction of the tangent and of the normal to the plane. The equation $F = W \sin\alpha$ shows that the force required to sustain a particle on a smooth plane is to the weight of the particle in the same ratio as the height of the plane to its length, as was shown by Stevinus and Galileo.

In the problem just treated, it is evident that the resultant of the applied forces W and F is opposite to R, that is, is normal to the plane. Similarly for equilibrium on any smooth surface, it is necessary that the resultant of all the applied forces shall be normal to the surface, for if it had any component parallel to the tangent plane this component would move the particle along the surface. Since the particle is constrained to move on a surface, there will be a relation between x, y, z, the coordinates of the particle, $\phi(x, y, z) = 0$, which is the equation of the surface; and since the direction cosines of the normal n are given by the equations

$$\cos(nx) : \cos(ny) : \cos(nz) = \frac{\partial\phi}{\partial x} : \frac{\partial\phi}{\partial y} : \frac{\partial\phi}{\partial z},$$

if X, Y, Z are the components of the resultant of the applied forces, we have as the condition for equilibrium

$$\cos(Fx) = \frac{X}{F} = \cos(nx), \text{ etc.},$$

or

$$\frac{X}{\frac{\partial\phi}{\partial x}} = \frac{Y}{\frac{\partial\phi}{\partial y}} = \frac{Z}{\frac{\partial\phi}{\partial z}}. \qquad (5)$$

If the surface is not smooth, the reaction between the particle and the surface is not normal, but there is a tangential component which is called *friction*. The force of friction is peculiar in that it cannot produce but only hinder motion, and in having its direction determined as opposite to the direction in which the other forces tend to make the particle move. The law usually assumed governing friction is that when motion is just about to take place the friction, or tangential component of the reaction, is proportional to the normal component, the factor of proportionality being a constant for two given substances, such as those composing the particle and plane, as above. Suppose that in the problem of the inclined plane the force F is the force of friction. Then we have $F = \mu R$, where μ is a constant for the given particle and plane called the coefficient of friction. Equations (4) then give

$$F = R\tan\alpha = \mu R, \quad \mu = \tan\alpha,$$

when the particle is just about to slide down. If the plane is any steeper than the value of α thus given, equilibrium is not possible. This angle is called the *angle of friction*.

3. Let us now consider a *rigid* body, that is, one composed of a continuous distribution of matter having the property that the distance between any two of its points is invariable, no matter to what forces it is subjected. It is evident that if equal and opposite forces, P and Q, Fig. 8, be applied to such a body at two points A and B such that the line AB has the direction of the forces, no motion will be produced, for reasons of symmetry with respect to AB. Equilibrium is also independent of the position of B on the line AB.

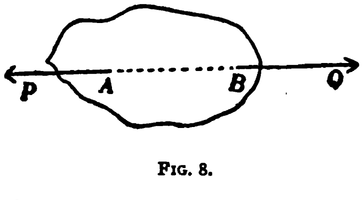

FIG. 8.

Consequently the force Q might be applied at A, where it might be compounded with P, giving a vanishing resultant. The principle that any force applied to a rigid body may be considered as applied at any other point in its line of direction is known as that of the *transmissibility of force*. As an application, if the lines of direction of three forces, P, Q, R (Fig. 9), intersect in a common point O, they may be transferred to that point, and if they satisfy the conditions for the equilibrium of forces applied to a material particle, they will produce equilibrium of the rigid body.

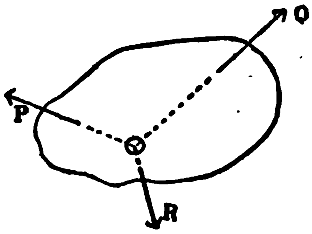

FIG. 9.

Suppose we have two parallel forces P and Q applied at any points A, B, of a rigid body, (Fig. 10). If we apply at A and B any two equal and opposite forces AR, BS, in the direction of AB, equilibrium will not be affected. Compound these respectively with AP, BQ, and transfer the resultants AC, BD, to the intersection of their lines of direction E and there resolve them into components in the original directions. From the equality of the parallelograms $EKFH$ and $APCR$, $ELGJ$ and $BQDS$, the components EJ and EH are equal and opposite, so that there remain only the components EK and EL, in the same direction, equal to the given forces AP, BQ, respectively. Thus the resultant of two parallel forces in the same direction applied to a rigid body is a force in the same direction equal to their sum. Obviously it may be considered as applied at any point O in the line EK. Suppose O to lie on AB. By similar triangles $\frac{AP}{AR}=\frac{OE}{AO}$, $\frac{BQ}{BS}=\frac{OE}{BO}$, and by division, since $AR=BS$, $\frac{AP}{BQ}=\frac{BO}{AO}$. Thus the distance of the intersection of the line of direction of the resultant with AB from A and B is inversely proportional to the forces applied at those points. This is the principle of the lever, as known to Archimedes.

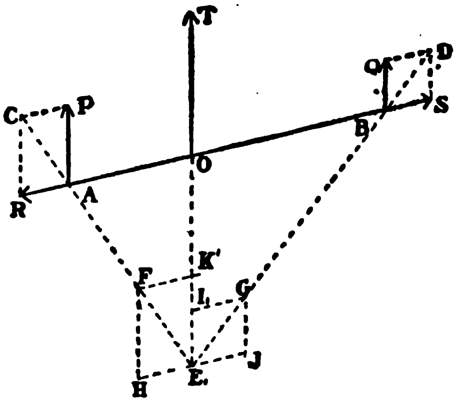

FIG. 10.

If the forces P and Q are the weights w_1, w_2, of two particles, placed at AB, the point O is called the *center of gravity* of the two particles. It is also called the weighted mean point of points AB with the weights w_1, w_2. If we project the points A, B, O upon the coordinate axes, the projections of AO, BO, are in the same ratios as the lengths themselves; consequently if their coordinates are respectively x_1, y_1, z_1, x_2, y_2, z_2, $\bar{x}$, $\bar{y}$, $\bar{z}$,

$$\frac{\bar{x}-x_1}{x_2-\bar{x}}=\frac{\bar{y}-y_1}{y_2-\bar{y}}=\frac{\bar{z}-z_1}{z_2-\bar{z}}=\frac{m_2}{m_1},$$

or

$$(6)\qquad \bar{x}=\frac{m_1x_1+m_2x_2}{m_1+m_2},\quad \bar{y}=\frac{m_1y_1+m_2y_2}{m_1+m_2},$$

$$\bar{z}=\frac{m_1z_1+m_2z_2}{m_1+m_2}.$$

By a generalization, we obtain for the center of gravity of any number of points, or the resultant of any number of parallel forces,

$$(7)\qquad \bar{x}=\frac{\Sigma mx}{\Sigma m},\quad \bar{y}=\frac{\Sigma my}{\Sigma m},\quad \bar{z}=\frac{\Sigma mz}{\Sigma m}.$$

If the two forces AP, BQ, are in opposite directions, instead of Fig. 10 we have the construction of Fig. 11, and the resultant is evidently equal to the *difference* of the two components, while the point O lies outside the segment AB. We may say that in general the resultant is equal to the *algebraic* sum of the components. In Fig. 11, if AP and BQ are made more nearly equal, the point O recedes to a greater distance, and in the case of equality, when we have AC parallel to BD, O must be infinitely distant. The same result is given by the formulæ (6), putting $m_1+m_2=0$. In other words, two equal, parallel, and *oppositely* directed forces applied to a rigid body cannot be replaced by a single resultant. Such a pair of forces is called a *couple*. The perpendicular distance between the two lines of direction of the members of the couple is called its *arm*. The product of the magnitude of either force by the arm of the couple is called the *moment* of the couple. The plane

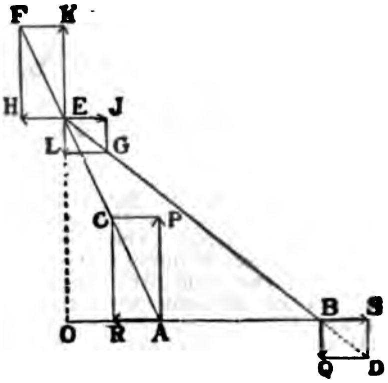

FIG. 11.

of the couple is the plane containing both forces. We have shown that a couple cannot be equilibrated by any single force, but it may be by another couple. This couple may be chosen in an infinite variety of ways. It may easily be shown by drawing the members of the second couple as about to be prescribed, and compounding the forces two and two, by the rules already given, that the equilibrating couple may be equilibrated by any of the following, and that the given couple may accordingly be replaced by: 1° An equal and parallel couple in any plane parallel to its own; 2° An equal couple turned about its point of symmetry; 3° A couple in the same plane having different arm and forces but the same moment. Thus all that characterizes a couple is the magnitude of its moment and the direction of the normal to the plane of the couple. The couple then behaves like a directed quantity, and may be symbolized by a line in the direction of the normal to its plane, whose length gives the magnitude of the moment. That couples are also compounded by the vector law is easily seen, for consider the forces of the two couples to be applied at two points AB in the line of intersection of their two planes. This can be done by bringing the couples to have the same arm. Let P_1P_2 (Fig. 12) be the members of one couple, Q_1Q_2 those of the other. Compound P_1Q_1 by the parallelogram law to R_1, P_2Q_2 to R_2. These being equal, parallel, and oppositely directed, form a couple which, having the same arm as the original couples, has its moment proportional to R, that is, found by the parallelogram construction. If lines are laid off perpendicular to the three planes of AB and P, Q, R, respectively, and proportional to the three moments, they will also follow the parallelogram law. Thus a couple may be represented by a vector perpendicular to its plane. This vector we shall speak of as *the couple*, and shall disregard the resolution into two separate forces.

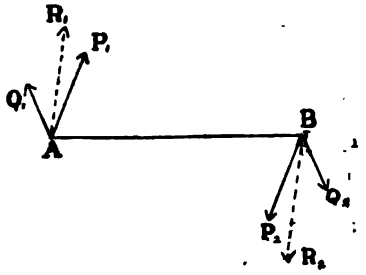

Fig. 12.

Let us now consider the effect of any number of forces applied at various points of a rigid body. At any point O (Fig. 13) apply two equal and opposite forces $P'P''$ equal and parallel to a force P applied at A. We thus have the force P' equal to P applied at O instead of at A, together with the couple PP''. Similarly all the forces applied at other points may be considered applied at O, by introducing in each case a couple. All the forces at O may be compounded into a single resultant, and all the couples into a single couple. Thus the resultant of any number of forces applied to a rigid body is a single force together with a single couple. Evidently the resultant force does not depend upon the position of the point O, while the resultant couple does. In order to have equilibrium, both the resultant force and the resultant couple must vanish. In order to express these conditions analytically, we must find an expression for the moment of a vector about a given point, that is, the product of the magnitude of the vector by the length of the perpendicular dropped upon it from the given point. This moment is thus numerically equal to the area of the parallelogram formed with the given point as one corner and the given vector as one side. As plane areas may be projected on other planes by multiplying by the cosine of the dihedral angle between them, which is equal to the angle between their normals, it is evident that the area of the parallelogram, and hence the moment, may be represented by a vector perpendicular to its plane, as already shown for the moment of a couple. Thus it is only necessary to find expressions for the three projections of a moment. Let the vector F (Fig. 14), with components X, Y, be applied at a point having the coordinates x, y Its moment about the origin is equal to the area of a parallelogram having as adjacent sides lines drawn from the origin to points x, y and X, Y. This area is equal to $xY-yX$. But this is the projection on the XY-plane of the area of the parallelogram on the lines from O to points x, y, z, and X, Y, Z. It therefore represents the Z-component of the required moment. Similarly the three components are obtained,

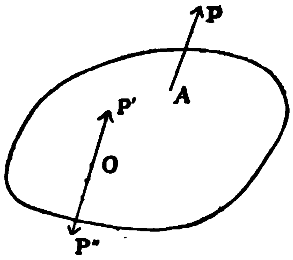

Fig. 13.

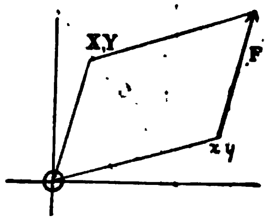

Fig. 14.

$$(8) \quad L=yZ-zY, \quad M=zX-xZ, \quad N=xY-yX.$$

The moment of a couple is the sum of the moments of its two members, and if X, Y is applied at x_1, y_1, $-X$, $-Y$ at x_2, y_2, we obtain for the moment of the couple

$$x_1Y-y_1X-x_2Y+y_2X=(x_1-x_2)Y-(y_1-y_2)X,$$

which evidently does not depend on the choice of the origin, but only on the vector F and the *relative* position of the two points of application, since only differences of x_1x_2, y_1y_2 appear.

The analytical statement of the conditions for equilibrium of a rigid body is then

$$(9)\qquad \Sigma X=0,\quad \Sigma Y=0,\quad \Sigma Z=0;$$
$$\Sigma(yZ-zY)=0,\quad \Sigma(zX-xZ)=0,$$
$$\Sigma(xY-yX)=0,$$

the first three expressing the vanishing of the resultant force, the last three the vanishing of the resultant couple. These principles suffice for the treatment of all problems concerning the equilibrium of a rigid body. For example, the extended principle of the lever follows from the theory of moments. Consider now the problem of a ladder standing on a smooth floor and leaning against a smooth wall (Fig. 15). The resultant of the weights of all the parts of the ladder is a single force W applied at the center of gravity G. Besides this we have to consider the normal reactions R and S. Resolving vertically we find for equilibrium $W-R=0$. Resolving horizontally there must be a force to balance S. Let this be P, applied at the lower end of the ladder. Then $P-S=0$. This does not determine the value of P or S, but we may do this by taking moments about any point in the plane of the figure. If we choose the lower end of the ladder, P and R will have zero moment, and if l is the length of the ladder, α the inclination,

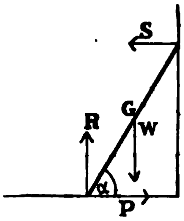

FIG. 15.

$$Sl\sin\alpha-(Wl\cos\alpha)/2=0,\quad S=\tfrac{1}{2}W\operatorname{ctn}\alpha.$$

If the floor is rough, and P the friction, $P=\mu R=\mu W=S=\frac{1}{2}W\operatorname{ctn}\alpha$, $\mu=\frac{1}{2}\operatorname{ctn}\alpha$, and if α is less than the angle determined by this equation, the ladder will slip down.

4. All the principles of statics are comprised in the Principle of Virtual Work. The conception of work is equally important with that of force. Work is done when the point of application of a force moves, the amount of work being defined as the product of the magnitudes of the force and the distance moved by the cosine of the angle included by them. If F denote the force, D the displacement, the work is $FD\cos(FD)$. This *geometric* or *scalar product* of two vectors (not a vector, since it is not associated with direction, but merely with a number, or scalar) defined as the product of either by the projection on it of the other, is of much importance in our whole subject. The angle between two directions is given by the symmetric function of their direction cosines

$$\cos(FD)=\cos(Fx)\cos(Dx)$$
$$+\cos(Fy)\cos(Dy)+\cos(Fz)\cos(Dz).$$

Now if the projections on the axes of coordinates of the two vectors are

$$(10)\qquad F_x=F\cos(Fx),\quad F_y=F\cos(Fy),$$
$$F_z=F\cos(Fz),$$
$$D_x=D\cos(Dx),\quad D_y=D\cos(Dy),$$
$$D_z=D\cos(Dz),$$

we have

$$(11)\qquad FD\cos(FD)=F_xD_x+F_yD_y+F_zD_z$$

as the analytic expression for the scalar product. If one of the vectors is taken as of unit length, the expression (11) gives us the value of the projection F_s of any vector F on any direction s,

$$(12)\qquad F_s=F\cos(Fs)=F_x\cos(sx)$$
$$+F_y\cos(sy)+F_z\cos(sz).$$

It is easily proved that the work of the resultant of two forces in a displacement is the sum of the works of the components.

In the case of an infinitely small displacement dx, dy, dz, the work is

$$(13)\qquad dW=F_x\,dx+F_y\,dy+F_z\,dz,$$

and if the point is moved along a curve the whole work is

$$(14)\qquad W=\int(F_x\,dx+F_y\,dy+F_z\,dz),$$

where x, y, z, F_x, F_y, F_z are supposed given in terms of some parameter, so that the integration along the curve can be performed.

If some of the points of a system are not free, but constrained, a *virtual* displacement is one that is consistent with the constraints. Virtual work is work done in a virtual displacement. The *Principle of Virtual Work* states that in a system of forces in equilibrium the work done in an infinitesimal *arbitrary* virtual displacement vanishes. Let us apply this principle to a number of simple cases. First, two equal weights P hanging from a string over a fixed pulley are in equilibrium. If the system is displaced one weight falls as much as the other rises. For the one that falls the displacement is in the direction of the force, and the work is positive and equal to PD. For the one that rises the displacement is opposite to the direction of the force, and the work is negative and equal to $-PD$. The sum of these two quantities thus vanishes. In the case of a weight hanging from a movable pulley (Fig. 16), if the string on the left is pulled up a distance D, the force T_1 does the positive work T_1D; but from the geometry of the case the weight P rises a distance $D/2$ and the weight W accordingly does the nega-

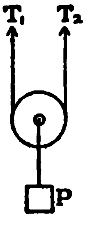

FIG. 16.

tive work $-PD/2$. The whole work is zero, if $T=P/2$. But this is the condition of equilibrium as found by resolution, since the tensions T_1 and T_2 are equal and we must have $T_1+T_2-P=0$. Consider a lever (Fig. 17)

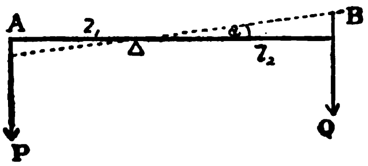

FIG. 17.

carrying the weights P, Q at distances l_1, l_2 from the fulcrum. Then for equilibrium the principle of moments gives $Pl_1=Ql_2$. But if the lever be turned through an infinitesimal angle α, the end A moves a distance downward $D_1=l_1\alpha$ and the weight does the positive work $Pl_1\alpha$, while the end B rises a distance $D_2=l_2\alpha$, and Q does the negative work $-Ql_2\alpha$. The whole work is zero if $Pl_1=Ql_2$, which is the condition for equilibrium. In the case of the inclined plane (Fig. 7), if the particle is displaced a small distance d up the plane, the force F does the work Fd. The weight W does the negative work $-Wd\sin\alpha$, since its direction makes an obtuse angle with the displacement. The reaction does no work, since it is perpendicular to the displacement. The whole work is therefore zero if $F=W\sin\alpha$. But this is the condition of equilibrium. The principle of virtual work is particularly convenient, since it enables us to leave the reactions out of account, since they do no work when the displacements are virtual. As a further example let us consider the equilibrium of a particle whose coordinates are x, y, z on a surface $\phi(x,y,z)=0$, under the action of forces whose resultant is X, Y, Z, omitting the reaction. Since the displacement is virtual, we must have $\phi=0$ during the displacement, so that

$$(15)\qquad d\phi=\frac{\partial\phi}{\partial x}dx+\frac{\partial\phi}{\partial y}dz+\frac{\partial\phi}{\partial z}dz=0.$$

The principle of virtual work says that for equilibrium

$$(16)\qquad Xdx+Ydy+Zdz=0$$

for any virtual displacement, that is, one in which dx, dy, dz are not independent, but satisfy (15). Multiplying (15) by an undetermined factor λ and adding to (16), we have

$$(17)\qquad \left(X+\lambda\frac{\partial\phi}{\partial x}\right)dx+\left(Y+\lambda\frac{\partial\phi}{\partial y}\right)dy+\left(Z+\lambda\frac{\partial\phi}{\partial z}\right)dz=0.$$

Both conditions are satisfied if we determine λ so that

$$(18)\qquad X+\lambda\frac{\partial\phi}{\partial x}=Y+\lambda\frac{\partial\phi}{\partial y}=Z+\lambda\frac{\partial\phi}{\partial z}=0,$$

or eliminating λ,

$$(19)\qquad \frac{X}{\dfrac{\partial\phi}{\partial x}}=\frac{Y}{\dfrac{\partial\phi}{\partial y}}=\frac{Z}{\dfrac{\partial\phi}{\partial z}}.$$

But this is the condition (5) that the resultant is normal to the surface, and in fact only in this way can there be equilibrium, according to the definition of a smooth surface.

For a rigid body, a possible displacement is one in which all the points receive equal and parallel displacements, so that dx, dy, dz are the same for all. We then have

$$(20)\qquad \Sigma(Xdx+Ydy+Zdz)=dx\Sigma X+dy\Sigma Y+dz\Sigma Z=0.$$

If this is to be true for arbitrary values of dx, dy, dz we must have

$$(21)\qquad \Sigma X=\Sigma Y=\Sigma Z=0,$$

which are three of the conditions for equilibrium already found. A second possible displacement of a rigid body is one in which it is turned through an angle $d\theta$ about the Z-axis.

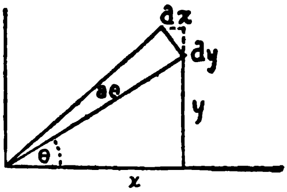

FIG. 18.

Let us introduce polar coordinates, so that $x=r\cos\theta$, $y=r\sin\theta$. Then in the rotation, r being constant,

$$dx=-r\sin\theta\,d\theta=-y\,d\theta,\ dy=r\cos\theta\,d\theta=x\,d\theta,\ dz=0.$$

Consequently the virtual work is

$$(22)\qquad \Sigma(Xdx+Ydy+Zdz)=d\theta\Sigma(xY-yX).$$

If this is to vanish whatever $d\theta$ we must have

$$(23)\qquad \Sigma(xY-yX)=0.$$

But this is one of the conditions for equilibrium (9) already found, and the two others are similarly found by rotating about the other axes.

Suppose now that we have any number of points $x_1, y_1, z_1, \ldots x_n, y_n, z_n$, acted on by any forces, $X_1, Y_1, Z_1, \ldots X_n, Y_n, Z_n$, and subject to any number of constraints,

$$(24)\qquad \begin{aligned}&\phi_1(x_1, y_1, z_1, \ldots x_n, y_n, z_n)=0,\\ &\phi_2(x_1, y_1, z_1, \ldots x_n, y_n, z_n)=0,\\ &\ldots\ldots\ldots\ldots\\ &\phi_k(x_1, y_1, z_1, \ldots x_n, y_n, z_n)=0.\end{aligned}$$

Then the equation of virtual work,

$$(25)\qquad \sum_{r=1}^{r=n}(X_rdx_r+Y_rdy_r+Z_rdz_r)=0,$$

must hold for any changes of the coordinates which satisfy the conditions,

$$d\phi_1=\sum_{r=1}^{r=n}\left(\frac{\partial\phi_1}{\partial x_r}dx_r+\frac{\partial\phi_1}{\partial y_r}dy_r+\frac{\partial\phi_r}{\partial z_r}dz_r\right)=0.$$

$$(26)\qquad \ldots\ldots\ldots\ldots\ldots\ldots$$

$$d\phi_k=\sum_{r=1}^{r=n}\left(\frac{\partial\phi_k}{\partial x_r}dx_r+\frac{\partial\phi_k}{\partial y_r}dy_r+\frac{\partial\phi_k}{\partial z_r}dz_r\right)=0.$$

Multiplying these equations in turn by multipliers $\lambda_1, \ldots \lambda_k$, and adding to (25),

$$(27)\quad \sum_{r=1}^{r=n}\left[\left(X_r+\sum_{s=1}^{s=k}\lambda_s\frac{\partial\phi_s}{\partial x_r}\right)dx_r + \left(Y_r+\sum_{s=1}^{s=k}\lambda_s\frac{\partial\phi_s}{\partial y_r}\right)dy + \left(Z_r+\sum_{s=1}^{s=k}\lambda_s\frac{\partial\phi_s}{\partial z_r}\right)dz_r\right]=0,$$

which is satisfied for all virtual values of $dx_1, \ldots dz_n$, if we take

$$(28)\quad \begin{aligned} X_r+\sum_{s=1}^{s=k}\lambda_s\frac{\partial\phi_s}{\partial x_r}&=0,\\ Y_r+\sum_{s=1}^{s=k}\lambda_s\frac{\partial\phi_s}{\partial y_r}&=0, \quad r=1, 2, \ldots n.\\ Z_r+\sum_{s=1}^{s=k}\lambda_s\frac{\partial\phi_s}{\partial z_r}&=0. \end{aligned}$$

From these equations, eliminating the k multipliers $\lambda_1, \ldots \lambda_k$, we have $3n-k$ equations of equilibrium.

5. **Kinematics.**—Let us now consider questions of motion. The velocity of a point is defined as the limit of the space Δs described by it to the time of description Δt, when both decrease indefinitely,

$$(29)\quad v=\lim_{\Delta t=0}\frac{\Delta s}{\Delta t}=\frac{ds}{dt}.$$

Since displacements are compounded as vectors, the resultant of a displacement AB (Fig. 1), and another BD being AD, if the two displacements take place in the same time, the velocities are also proportional to the three lines, so that velocities are vectors, compounded by the parallelogram. Accordingly a velocity may be represented by its components along the coordinate axes. Its direction being that of the tangent to the path, its direction cosines are those of the tangent, $\frac{dx}{ds}, \frac{dy}{ds}, \frac{dz}{ds}$. Consequently, its components are

$$(30)\quad v_x=v\frac{dx}{ds}=\frac{ds}{dt}\frac{dx}{ds}=\frac{dx}{dt},$$

$$v_y=v\frac{dy}{ds}=\frac{ds}{dt}\frac{dy}{ds}=\frac{dy}{dt},\quad v_z=v\frac{dz}{ds}=\frac{ds}{dt}\frac{dz}{ds}=\frac{dz}{dt}.$$

Also,

$$(31)\quad \begin{aligned} v^2&=v_x^2+v_y^2+v_z^2\\ &=\left(\frac{dx}{dt}\right)^2+\left(\frac{dy}{dt}\right)^2+\left(\frac{dz}{dt}\right)^2=\left(\frac{ds}{dt}\right)^2. \end{aligned}$$

Similarly, the projection of a velocity in any direction is the velocity of the projection of the point on a line having that direction.

If a point moves in a plane it may be convenient to introduce polar coordinates r, ϕ If the point moves from A to B (Fig. 19), a distance Δs in the time Δt, dropping a perpendicular AC upon the radius OB, the displacement may be resolved into AC and CD, equal to $r\Delta\phi$ and Δr respectively, and accordingly the velocity may be resolved into the components in those directions,

$$(32)\quad v_\phi=\lim_{\Delta t=0}\frac{r\Delta\phi}{\Delta t}=r\frac{d\phi}{dt},\quad v_r=\lim_{\Delta t=0}\frac{\Delta r}{\Delta t}=\frac{dr}{dt}.$$

Also,

$$(33)\quad v^2=v_\phi^2+v_r^2=r^2\left(\frac{d\phi}{dt}\right)^2+\left(\frac{dr}{dt}\right)^2=\left(\frac{ds}{dt}\right)^2,$$

as may also be seen from the expression for the arc in polar coordinates. The components

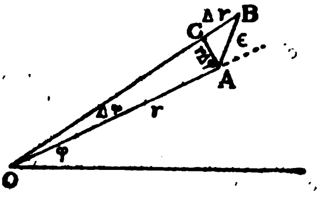

Fig. 19.

v_r and v_ϕ are called the radial and transverse components of the velocity respectively, while $\frac{d\phi}{dt}$ is called the angular velocity of the radius.

The area of the triangle OAB being $\frac{1}{2}r^2d\phi$, the radius vector sweeps over area at the rate $\frac{dS}{dt}=\frac{1}{2}r^2\frac{d\phi}{dt}$, but since the area is also equal to one half the product of AB by the perpendicular on it from O, dividing by dt we find this rate of area description to be equal to one half the *moment of the velocity* about O. Using the formula (8) for moment of a vector, we have

$$(34)\quad \frac{dS}{dt}=\frac{1}{2}r^2\frac{d\phi}{dt}=\frac{1}{2}(xv_y-yv_x)=\frac{1}{2}\left(x\frac{dv}{dt}-y\frac{dx}{dt}\right),$$

which may be easily verified by passing directly from rectangular to polar coordinates.

6. If the velocity of a point varies we define the *acceleration* as the limit of the increment of velocity to the time in which it takes place. We may consider the numerical change,

$$(35)\quad \lim_{\Delta t=0}\frac{\Delta v}{\Delta t}=\frac{dv}{dt}=\frac{d^2s}{dt^2},$$

or the vector change. If AB (Fig. 20) denote the velocity at a time t, AC the velocity at

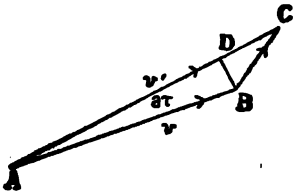

Fig. 20.

the time $t+\Delta t$, the vector increase of velocity is BC, and the acceleration is the limit of the ratio of BC to Δt. Obviously it may be resolved into any components, which are the corresponding components of BC each divided by Δt. In the triangle ABC, since the velocities AB and AC have the directions of the tangents to the path at the respective instants the angle between them is the angle $d\tau$ between the two consecutive tangents. It is obvious that the direction of the infinitesimal side BC may be anything whatever, and that accordingly the direction of the acceleration is totally unrelated to that of the velocity, that is of the tangent to the path. Resolving along the axes, we find for the components of the accelerations

$$(36)\qquad a_x = \frac{dv_x}{dt} = \frac{d^2x}{dt^2}, \quad a_y = \frac{dv_y}{dt} = \frac{d^2y}{dt^2}, \quad a_z = \frac{dv_z}{dt} = \frac{d^2z}{dt^2},$$

from which

$$(37)\qquad a^2 = \left(\frac{d^2x}{dt^2}\right)^2 + \left(\frac{d^2y}{dt^2}\right)^2 + \left(\frac{d^2z}{dt^2}\right)^2.$$

Since the direction cosines of the tangent are the same as those of the velocity, v_x/v, v_y/v, v_z/v, we may use formula (12) to resolve the acceleration along the tangent,

$$(38)\qquad a_T = (a_xv_x + a_yv_y + a_zv_z)/v = \left(\frac{d^2x}{dt^2}\frac{dx}{dt} + \frac{d^2y}{dt^2}\frac{dy}{dt} + \frac{d^2z}{dt^2}\frac{dz}{dt}\right)\Big/\frac{ds}{dt}.$$

But differentiating equation (31) and comparing with (38), we find

$$(39)\qquad a_T = \frac{d^2s}{dt^2}.$$

Thus the rate of increase of the numerical velocity is equal, not to the whole acceleration, but to its tangential component. This we call the tangential acceleration, and it is equal to the limit of DC (Fig. 20), divided by Δt. The normal acceleration is easily obtained from the figure as the limit of BD divided by Δt. But in the figure we have $BD = AB \cdot d\tau = vd\tau$, so that the normal acceleration,

$$(40)\qquad a_\nu = v\frac{d\tau}{dt}.$$

Also, if ρ is the radius of curvature of the path, $ds = \rho d\tau$,

$$(41)\qquad a_\nu = \frac{v}{\rho}\frac{ds}{dt} = \frac{v^2}{\rho}.$$

The normal acceleration is always directed toward the *concave* side of the path, and is called the *centripetal acceleration.*

We will now consider some of the most important cases of acceleration. If the motion is rectilinear, the velocity and the acceleration have always the same direction, but may vary in magnitude and in sign. After uniform motion, in which the velocity is constant and the acceleration zero, so that equal spaces are described in equal times, the simplest case is that of constant acceleration,

$$(42)\qquad \frac{d^2s}{dt^2} = a = \text{const.}$$

Integrating we obtain

$$(43)\qquad \frac{ds}{dt} = at + b,$$

where b is a constant representing the velocity when $t = 0$. Integrating again,

$$(44)\qquad s = \tfrac{1}{2}at^2 + bt,$$

where s denotes the space described since $t = 0$. Thus if the particle start from rest ($b = 0$), it describes spaces proportional to the *squares* of the times of description. It was found by Galileo that bodies fall toward the earth according to such a law, and that in a given locality the value of the acceleration is the same for all bodies. The value of this acceleration of gravity is generally denoted by g. Comparing the velocity attained by a body falling from rest with the height, we obtain, by (43) and (44),

$$(45)\qquad v = gt, \quad h = \tfrac{1}{2}gt^2, \quad v^2 = 2gh.$$

Conversely, if a body be thrown upwards with a velocity v, it will reach the height h.

If we consider the motion of a body under gravity, but possessing a horizontal velocity as well as a vertical component, since there is no horizontal acceleration the horizontal velocity v_x is constant. Calling the vertical distance fallen z, the horizontal distance traversed x, we have

$$z = \tfrac{1}{2}gt^2, \quad x = v_xt,$$

and eliminating t we have the equation of the path, $z = \frac{1}{2}\frac{gx^2}{v_x^2}$, representing a parabola with the axis vertical. The velocity at any point and its inclination to the horizontal are found from

$$v_z = gt = \sqrt{2gz}, \quad v^2 = v_x^2 + v_z^2, \quad \tan\alpha = v_z/v_x.$$

If, on the other hand, the particle be projected upward with velocity v at an angle α with the horizontal, it will describe the same parabola, rising to the vertex in the time t and falling on the symmetrical half. This problem was also solved by Galileo.

Consider a particle revolving with constant velocity v in a circular path of radius r. Then since $s = vt$, by (39) we find that the tangential component of the acceleration vanishes. The normal component is given by (41) as v^2/r. Thus the acceleration is constant in amount and always directed toward the center. It is to be observed that although the numerical velocity is constant, the vector velocity is constantly changing its direction, hence the acceleration is not zero, but is perpendicular to the velocity. If we resolve the uniform circular motion into components parallel to given directions, for instance, if P (Fig. 21) is projected into Q and R lying on the axes OX, OY, and if P revolves with constant angular

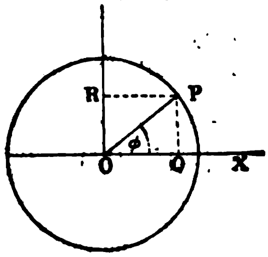

FIG. 21.

velocity $\omega = \frac{d\phi}{dt}$, we have $\phi = \omega t$, $OQ = r \cos \phi = r \cos \omega t$, $OR = r \sin \phi = r \sin \omega t$. The rectilinear motion of either Q or R is called *simple harmonic motion*, or a *simple vibration*. It is evidently periodic, that is, it repeats after the interval $T = \frac{2\pi}{\omega}$. The number of vibrations in unit of time, or the *frequency*, is $\frac{1}{T} = \frac{\omega}{2\pi}$. Since the acceleration of P is constant in magnitude, and always in the direction PO, its component along OX varies as $\cos \phi$, that is, as the distance OQ. In other words, a point describing a simple harmonic motion has an acceleration proportional to its displacement from the center of symmetry, and directed towards it. We may also consider harmonic motion analytically. If the acceleration is proportional to the displacement but opposite in direction, we shall have

$$\frac{d^2 s}{dt^2} = -\omega^2 s, \tag{46}$$

where ω is a constant. The integral of this differential equation is

$$s = A \cos \omega t + B \sin \omega t = a \cos(\omega t - \alpha), \tag{47}$$

where A and B are arbitrary constants and $A = a \cos \alpha$, $B = a \sin \alpha$. The constant a is called the *amplitude*, while the angle α, called the *epoch*, depends simply upon the instant adopted from which to count the time. By taking for α the values 0° or 90° we obtain either $a \cos \omega t$ or $a \sin \omega t$.

If we compound two simple harmonic motions in lines at right angles to each other, if the amplitudes and periods are the same and the epochs differ by a right angle, the previous construction shows that we obtain uniform circular motion. If the amplitudes and epochs do not have this relation, we have

$$\begin{aligned} x &= a \sin(\omega t - \alpha) \\ &= a(\sin \omega t \cos \alpha - \cos \omega t \sin \alpha), \\ y &= b \sin(\omega t - \beta) \\ &= b(\sin \omega t \cos \beta - \cos \omega t \sin \beta). \end{aligned} \tag{48}$$

Solving for $\sin \omega t$ and $\cos \omega t$,

$$\begin{aligned} \sin \omega t &= \left(\frac{x}{a} \sin \beta - \frac{y}{b} \sin \alpha\right) \Big/ \sin(\beta - \alpha), \\ \cos \omega t &= \left(\frac{x}{a} \cos \beta - \frac{y}{b} \cos \alpha\right) \Big/ \sin(\beta - \alpha). \end{aligned} \tag{49}$$

Squaring and adding we eliminate t and obtain the equation of the path,

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} - 2\frac{x}{a}\frac{y}{b} = \sin^2(\alpha - \beta), \tag{50}$$

which represents an ellipse. The motion is called *elliptic harmonic motion*. The ellipse is evidently inscribed in a rectangle of sides $2a$, $2b$ (Fig. 22), and according to the values of $\alpha - \beta$ may have any shape, reducing to a straight line when $\alpha - \beta$ is zero or 180°. If the two harmonic vibrations are not of the same period, the resulting path belongs to a system of curves associated with the name of Lissajous. They may be easily constructed point by point, but the elimination of t will be possible only if the periods have a common measure.

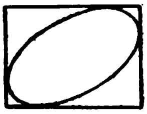

FIG. 22.

Suppose a particle subject to the constant acceleration of gravity to be constrained to move in a vertical circle of radius l (Fig. 23).

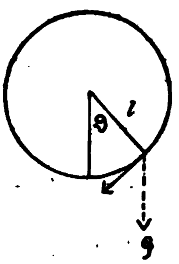

FIG. 23.

The component of the acceleration g in the direction of the tangent is $-g \sin \theta$, while the distance moved from the bottom of the circle is $l\theta$. We thus have the differential equation

$$\frac{d^2 s}{dt^2} = l\frac{d^2\theta}{dt^2} = -g \sin \theta. \tag{51}$$

The solution of this equation requires elliptic functions, but if θ is small enough we may neglect the difference between the angle θ and its sine, so that the equation of motion is

$$\frac{d^2\theta}{dt^2} = -\frac{g}{l}\theta, \tag{52}$$

which is the same as the equation (46) of harmonic motion with $\omega^2 = g/l$. Accordingly the small vibrations of a pendulum are harmonic, of the period $T = 2\pi\sqrt{\frac{l}{g}}$, which is independent of the amplitude of oscillation The fact of this *isochronism* of the pendulum, or independence of the period from the amplitude, was discovered by Galileo, while the laws of uniform circular and of harmonic motion, and of the pendulum, were found by Huygens. The latter also used the formula $g = \frac{4\pi^2 l}{T^2}$ to determine the value of g.

Let us now examine the consequences of the celebrated laws discovered by Kepler as governing the motion of the planets about the sun. The first law states that the areas swept over by the radius vector from the sun to a planet in equal times are equal. Calling the area S, $\frac{dS}{dt} = \text{const}$. But differentiating the value of $\frac{dS}{dt}$ given in (34), we find

$$2\frac{d^2 S}{dt^2} = x\frac{d^2 y}{dt^2} - y\frac{d^2 x}{dt^2} = x a_y - y a_x. \tag{53}$$

But this is the *moment* of the acceleration with respect to the origin, and if it vanishes, the acceleration must be directed toward the origin. The kinematical interpretation of the first law is then that the planets are accelerated toward the sun. The second law states that the planets describe ellipses about the sun as a focus. The equation of a conic section referred to its focus is

$$r=\frac{p}{1+e\cos\phi},\quad p=a(1-e^2),$$

where a is the major axis, e the eccentricity. Now to resolve the acceleration along the radius vector, we multiply its components a_x, a_y, respectively, by the direction cosines of the radius vector, which are $\cos\phi$, $\sin\phi$. Differentiating the equations for change of coordinates $x=r\cos\phi$, $y=r\sin\phi$, twice, we have

$$a_x=\frac{d^2x}{dt^2}=\frac{d^2r}{dt^2}\cos\phi-2\sin\phi\frac{d\phi}{dt}\frac{dr}{dt}$$

$$-r\sin\phi\frac{d^2\phi}{dt^2}-r\cos\phi\left(\frac{d\phi}{dt}\right)^2,$$

$$a_y=\frac{d^2y}{dt^2}=\frac{d^2r}{dt^2}\sin\phi+2\cos\phi\frac{d\phi}{dt}\frac{dr}{dt}$$

$$+r\cos\phi\frac{d^2\phi}{dt^2}-r\sin\phi\left(\frac{d\phi}{dt}\right)^2,$$

from which

$$(54)\quad a_r=a_x\cos\phi+a_y\sin\phi=\frac{d^2r}{dt^2}-r\left(\frac{d\phi}{dt}\right)^2.$$

Now by Kepler's first law,

$$2\frac{dS}{dt}=r^2\frac{d\phi}{dt}=\text{const.}=h,\quad \frac{d\phi}{dt}=\frac{h}{r^2}.$$

Changing the variable from t to ϕ,

$$\frac{dr}{dt}=\frac{dr}{d\phi}\frac{d\phi}{dt}=\frac{h}{r^2}\frac{dr}{d\phi}=-h\frac{d}{d\phi}\left(\frac{1}{r}\right).$$

Differentiating by t,

$$\frac{d^2r}{dt^2}=-h\frac{d^2}{d\phi^2}\left(\frac{1}{r}\right)\frac{d\phi}{dt}=-\frac{h^2}{r^2}\frac{d^2}{d\phi^2}\left(\frac{1}{r}\right).$$

From the equation of the path we obtain

$$\frac{1}{r}=\frac{1}{p}+\frac{e}{p}\cos\phi,\quad \frac{d^2}{d\phi^2}\left(\frac{1}{r}\right)=-\frac{e}{p}\cos\phi=\frac{1}{p}-\frac{1}{r},$$

from which

$$\frac{d^2r}{dt^2}=-\frac{h^2}{pr^2}+\frac{h^2}{r^3},\quad a_r=-\frac{h^2}{pr^2}.$$

Thus the fact that the path is a conic section shows that the acceleration is inversely as the square of the distance from the focus. The negative sign shows that it is *toward* the sun.

The third law states that for different planets the squares of the times of description of the orbits are proportional to the cubes of the major axes. Since $2dS/dt=h$, if T is the time of a complete period hT is twice the area of the orbit.

$$hT=2\pi ab=2\pi a^2\sqrt{1-e^2},\quad h^2=\frac{4\pi^2a^4}{T^2}(1-e^2),$$

$$(55)\quad a_r=-\frac{h^2}{pr^2}=-\frac{h^2}{a(1-e^2)}\frac{1}{r^2}=\frac{4\pi^2a^3}{T^2}\frac{1}{r^2}.$$

Now since a^3/T^2 is the same for all the planets, we see that the factor of $1/r^2$ in the acceleration is the same for all the planets. These kinematical interpretations of Kepler's laws in terms of acceleration were given by Newton.

6. KINETICS.—The whole of our experience of dynamical phenomena was summed up by Newton in his *Axioms or Laws of Motion*, which are as follows:

I. *Every body persists in its state of rest or of uniform motion in a straight line, except in so far as it is compelled by impressed forces to change that state.*

The property of persistence thus defined is called *Inertia*. The law of inertia was recognized in a less definite way by Galileo, but Newton makes of it a criterion for the existence of force, and in fact implies that if a body is moving in any other way than uniformly in a straight line, that is, without acceleration, it is acted on by a force. The second law gives a positive definition of force.

II. *Change of motion is proportional to the moving force applied, and takes place in the direction of the straight line in which the force acts.*

In the explanation of this law, and in a corollary appended, Newton makes clear that it is intended to include the independence of effect of two simultaneous forces, and their composition by the parallelogram.

In his introductory definitions, Newton states what he means by quantity of motion, to which force is proportional, namely, the product of velocity by mass, or what is now called *momentum*, but the notion of mass is best introduced by the third law, which is perhaps the most important, as well as original, of the three.

III. *To every action there is always an equal and contrary reaction; or, the mutual actions of any two bodies are always equal and oppositely directed.*

If the force were measured by the acceleration alone, the accelerations of the two interacting bodies would be *equal* and opposite; this is not the case, but they are found to be proportional, with a factor of proportionality which is found to be always the same for two given bodies, no matter how they act on each other. For example, let them be connected by a string, and act on each other through its tension, or by an elastic cord whose length may vary. If for symmetry we write a factor for each acceleration,

$$(56)\quad m_1\frac{d^2x_1}{dt^2}=-m_2\frac{d^2x_2}{dt^2},\quad m_1\frac{d^2y_1}{dt^2}=-m_2\frac{d^2y_2}{dt},$$

$$m_1\frac{d^2z_1}{dt^2}=-m_2\frac{d^2z_2}{dt^2},$$

the factors m_1, m_2 are called the *masses* of the bodies, and their ratio is determined by the ratio of the accelerations. Thus we may compare the mass of any body with that of a given body taken as a unit. The usual unit of mass is the pound or the gram.

By the introduction of the conception of mass and of momentum we pass from kinematics to kinetics, or dynamics proper. As long as we were concerned with one body at a time, like Galileo and Huygens, the notion of acceleration was sufficient, but when we deal with a number of bodies with mutual actions, the notion of force is necessary. The terms on either side of equations (56) represent the forces, and the equations express the third law. The second law may now be stated by saying that force is the rate of change of *momentum*. The forces generally are known in terms of the positions of the bodies, and perhaps of their velocities, and when given by their components X, Y, Z as functions of these quantities, the equations

$$(57)\qquad m\frac{d^2x}{dt^2}=X,\quad m\frac{d^2y}{dt^2}=Y,\quad m\frac{d^2z}{dt^2}=Z$$

are called the differential equations of motion.

Our kinematical examples of the previous section may now be dynamically interpreted. The fact that bodies fall with a common acceleration g shows that the forces with which they are moved towards the earth, or their weights, $W=mg$, are proportional to their masses. The unit of force, namely, that force which produces in a pound an acceleration corresponding to an increase of velocity of one foot per second in each second, has received the name of *poundal*. The weight of each pound is accordingly g poundals. The unit generally used by scientists is the force which produces in a gram the acceleration corresponding to an increase of velocity of one centimeter per second in each second. This force is called a *dyne*, and the weight of a gram is g dynes. These units are called *absolute* units, as they do not depend on accidental circumstances of time or place, but are referred to three fundamental units, of time, length, and mass, the latter two of which are preserved in concrete standards, the former is preserved in the rotation of the earth. The more familiar *gravitation unit*, which we have used in the section on statics, and which is the *weight* of the pound or gram, is not absolute, since g varies at different parts of the earth, according to the formula

$$(58)\qquad g=980.62-2.6\cos 2\lambda-.000003h,$$

where λ is the latitude, h the height above sea-level, and the units are the centimeter and the second. The weight of a body is accordingly variable, but its mass is invariable. For $\lambda=45^\circ$, at sea-level we have

Weight of pound = 32.17 *poundals*,
Weight of gram = 980.62 *dynes*.

The popular usage of the term pound or gram to denote both a mass and a force is unfortunate, and should be avoided.

The fact that the weights of bodies are proportional to their masses was carefully tested by Newton by constructing pendulums of different materials, and finding that the acceleration, as determined by the time of oscillation, was independent of the substance.

The fact that a body moving uniformly in a circle has a centripetal acceleration v^2/r shows that it is acted on by a force towards the center (centripetal force) equal to mv^2/r. If the body, for instance, be revolved in a horizontal orbit on a whirling machine, and be held in place by a string, this string may be passed over a pulley and support a weight, so that we may thus make a comparison between the absolute dynamical measure of force and the gravitational statical one previously used. By repeating the experiment with another revolving mass, we may compare the masses of two bodies, by the process of comparing both with the same weight. This illustrates the dynamical comparison of masses. The usual statical method of comparison by a balance is actually a comparison of *weights*, and gives a correct comparison of masses because the value of g is the same at each pan. If we used a balance-beam so long that g differed sensibly at its two ends, equality of weights would not mean equality of masses.

Another simple illustration of the dynamical method of comparison of masses is furnished by Atwood's machine, by which the laws of falling bodies may be studied. Two masses, m_1, m_2, Fig. 24, are hung from a string passing over a frictionless pulley. Since the distance moved up by one mass is equal to that moved down by the other, the velocities and accelerations of the two are equal and opposite. Each mass is acted upon by two forces, the tension of the string upwards and its own weight downwards. The tension is the same for both. Consequently we have for the acceleration a,

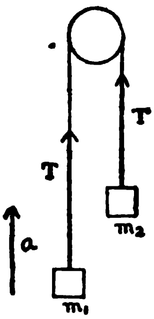

FIG. 24.

$$m_1a_1=m_1a=T-m_1g,$$
$$m_2a_2=-m_2a=T-m_2g,$$

from which we obtain

$$a=\frac{m_2-m_1}{m_2+m_1}g;$$

that is, the acceleration is to that of a body falling freely as the difference to the sum of the masses. Thus by observing the acceleration the masses may be compared. In the usual use of Atwood's machine the difference of masses is produced by an extra weight, which is taken off at a certain height by a fixed ring, after which the two remaining equal masses travel with uniform velocity, and by the velocity generated the acceleration is determined.

The properties of harmonic motion show that a body acted upon by a force proportional to its displacement from a fixed point will execute a harmonic vibration. When a point has a position of equilibrium and is displaced therefrom, forces will in general be brought into play tending to restore it to its position, and these forces will depend upon the displacement. If the displacement be small enough, the forces will be approximately proportional to the displacement, hence the frequency of harmonic vibrations in nature. The vibration of the pendulum or of a particle at the bottom of a bowl are examples.

From the generalization that all the planets are accelerated toward the sun with an acceleration $a = c/r^2$, where c is constant for all, Newton, putting the force equal to cm/r^2, and seeing that the masses of the two interacting bodies, the sun and planet, must enter symmetrically, was led to assume $F = \gamma Mm/r^2$, and from the law of reaction this would also be the force urging the sun toward the earth. Thus he was led to the generalization of universal gravitation, namely, the statement that every mass in the universe attracts every other with a force proportional to the product of both their masses, and inversely to the square of the distance apart. (The number γ is the same for all, depending only on the units used.)

Newton tested this by comparing the acceleration of the moon due to the earth's attraction with the acceleration of a body at the earth's surface. Supposing the moon's orbit to be circular, of radius r and period T, its acceleration will be by (55) $a_m = 4\pi^2 r/T^2$. If the acceleration varies inversely as the square of the distance, at the surface of the earth, it will be

$$a_e = a_m \frac{r^2}{R^2} = \frac{4\pi^2 r^3}{R^2 T^2},$$

where R is the earth's radius.

Now we have

$$T = 27d \cdot 43 \text{ m.} = 39{,}343 \text{ m.}, \quad 2\pi R = 4 \times 10^7 \text{ meters}, \quad r = 60R,$$

from which

$$a_e = \frac{2\pi \cdot 60^3 \cdot 4 \cdot 10^7 \text{ meters}}{(39{,}343 \cdot 60 \text{ sec})^2}$$

$$= 9.74 \frac{\text{meters}}{\text{sec}^2} = 974 \frac{\text{cm.}}{\text{sec}^2}.$$

This agrees well with the value of g from terrestrial observations, while more exact calculations give a still better agreement.

The value of the Newtonian constant, γ, or the number of dynes of attraction of two masses each of one gram, one centimeter apart, is $\gamma = 6.6576 \cdot 10^{-8}$.

A highly important contribution was made by d'Alembert, who made it possible to reduce every problem of dynamics to one of statics. If a system of particles be not free, they cannot move under the influence of given applied forces as they would if not constrained, but the reactions will cause them to move otherwise, as in the case of the masses in Atwood's machine. For another instance, consider two bullets fastened together by a string and thrown at random into the air. If free each would describe plane curves, namely, vertical parabolas. Under the influence of the tensions of the string which causes the constraint, they describe looped or tortuous paths. If we knew the actual paths and motions, we could find forces which would produce the same motions if the particles were free. These d'Alembert calls the effective forces and they are given by

$$X' = m\frac{d^2x}{dt^2}, \quad Y' = m\frac{d^2y}{dt^2}, \quad Z' = m\frac{d^2z}{dt^2}.$$

D'Alembert's principle states that the actual applied forces, together with the *reversed* effective forces, would form a system in equilibrium. If we express the equilibrium by means of the equation of virtual work, (25,) we obtain

$$\sum_r \{(X_r - X'_r)\delta x_r + (Y_r - Y'_r)\delta y_r + (Z_r - Z'_r)\delta z_r\} = 0,$$

or

$$(58) \quad \sum_r \left\{\left(m_r\frac{d^2x_r}{dt^2} - X_r\right)\delta x_r + \left(m_r\frac{d^2y_r}{dt^2} - Y_r\right)\delta y_r + \left(m_r\frac{d^2z_r}{dt^2} - Z_r\right)\delta z_r\right\} = 0.$$

This equation, given by Lagrange, was made by him the basis of all dynamics. Since the reactions would of themselves form a system of forces in equilibrium, they may be left out of the equation (58) of d'Alembert's Principle.

From the equation (58) we can deduce all the principles of dynamics. Suppose every particle is free, then all the virtual displacements, δx_r, δy_r, δz_r, are independent, and in order that the equation may hold for arbitrary displacements, we must have

$$(59) \quad m_r\frac{d^2x_r}{dt^2} = X_r, \quad m_r\frac{d^2y_r}{dt^2} = Y_r, \quad m_r\frac{d^2z_r}{dt^2} = Z_r$$

for every r. But these are Newton's equations of motion.

If the particles be free or form a rigid system, a virtual displacement will be given when δx_r, δy_r, δz_r have the same values for all the particles. We may then remove these factors from the summation,

$$(60) \quad \delta x\left(\sum_r m_r\frac{d^2x_r}{dt^2} - \sum_r X_r\right) + \delta y\left(\sum_r m_r\frac{d^2y_r}{dt^2} - \sum_r Y_r\right) + \delta z\left(\sum_r m_r\frac{d^2z_r}{dt^2} - \sum_r Z_r\right) = 0,$$

and if δx, δy, δz are arbitrary, this requires

$$(61) \quad \sum_r m_r\frac{d^2x_r}{dt^2} = \sum X_r, \quad \sum_r m_r\frac{d^2y_r}{dt^2} = \sum_r Y_r, \quad \sum_r m_r\frac{d^2z_r}{dt^2} = \sum_r Z_r.$$

Now we have

$$(62) \quad \sum_r m_r\frac{d^2x_r}{dt^2} = \frac{d^2}{dt^2}\sum_r m_r x_r = \left(\sum_r m_r\right)\frac{d^2\bar{x}}{dt^2},$$

$$\sum_r m_r\frac{d^2y_r}{dt^2} = \frac{d^2}{dt^2}\sum_r m_r y_r = \left(\sum_r m_r\right)\frac{d^2\bar{y}}{dt^2},$$

$$\sum_r m_r\frac{d^2z_r}{dt^2} = \frac{d^2}{dt^2}\sum_r m_r z_r = \left(\sum_r m_r\right)\frac{d^2\bar{z}}{dt^2},$$

where $\bar{x}$, y, $\bar{z}$ are the coordinates of the center of mass, which obviously coincides with what in the treatment of statics has been called the center of gravity. We thus find that the center of mass of a free system, or of a rigid body, moves as if all the forces of the system were applied at that point and all the mass were concentrated there. In particular if the system is exposed to no external forces, but only to its mutual actions, since these are equal and opposite in pairs, they destroy each other. Consequently the center of mass of such a system moves uniformly in a straight line. This applies to the solar system.

Under the same conditions, a rotation about an axis is a virtual displacement. Putting as in (22) $\delta x = -y\delta\theta$, $\delta y = x\delta\theta$, $\delta z = 0$, and dividing out $\delta\theta$, we have

$$(63)\quad \sum_r m_r\left(x_r\frac{d^2y}{dt^2} - y_r\frac{d^2x}{dt^2}\right) = \sum_r (x_rY_r - y_rX_r).$$

The quantity on the right is the z-component of the resultant moment of all the impressed forces, as in (9), (23), which will be denoted by the components L, M, N.

The quantity on the left may be written

$$\frac{d}{dt}\sum_r m_r\left(x_r\frac{dy_r}{dt} - y_r\frac{dx_r}{dt}\right).$$

The quantity whose derivative appears,

$$(64)\quad H_z = \sum_r\left(x_rm_r\frac{dy}{dt} - y_rm_r\frac{dx_r}{dt}\right) = \sum_r (x_rm_rv_{yr} - y_rm_rv_{xr}),$$

is evidently the z-component of the resultant *moment of momentum* of all of the particles of which the system is composed. We thus have the principle that if we construct a vector H having the components H_x, H_y, H_z, where

$$(64)\quad \begin{aligned} H_x &= \sum_r (y_rm_rv_{zr} - z_rm_rv_{yr}),\\ H_y &= \sum_r (z_rm_rv_{xr} - x_rm_rv_{zr}),\\ H_z &= \sum_r (x_rm_rv_{yr} - y_rm_rv_{xr}),\end{aligned}$$

in virtue of the equations

$$(65)\quad \frac{dH_x}{dt} = L,\quad \frac{dH_y}{dt} = M,\quad \frac{dH_z}{dt} = N,$$

the velocity of the extremity of the vector H, representing the moment of momentum of the system, is equal and parallel to the resultant moment of the impressed forces about the same point. This principle, with that of equations (61), suffices for the treatment of the motion of a rigid body. By putting all velocities equal to zero we obtain the conditions of equilibrium as in (9).

If in equation (58) we put for δx_r, δy_r, δz_r, the distances actually traversed by the various points in the actual motion in the interval dt,

$$\delta x_r = \frac{dx_r}{dt}dt,\quad \delta y_r = \frac{dy_r}{dt}dt,\quad \delta z_r = \frac{dz_r}{dt}dt,$$

we obtain

$$(66)\quad \sum_r m_r\left(\frac{d^2x_r}{dt^2}\frac{dx_r}{dt} + \frac{d^2y_r}{dt^2}\frac{dy_r}{dt} + \frac{d^2z_r}{dt^2}\frac{dz_r}{dt}\right)dt - \sum_r\left(X_r\frac{dx_r}{dt} + Y_r\frac{dy_r}{dt} + Z_r\frac{dz_r}{dt}\right)dt = 0,$$

and we may write the sum of terms containing the accelerations as an exact derivative,

$$\frac{d}{dt}\frac{1}{2}\sum_r m_r\left[\left(\frac{dx_r}{dt}\right)^2 + \left(\frac{dy_r}{dt}\right)^2 + \left(\frac{dz_r}{dt}\right)^2\right] = \frac{dT}{dt}.$$

The quantity T whose derivative appears, which is one half the sum of the products of the mass of each particle by the square of its velocity, is the very important quantity called the *kinetic energy*. Integrating equation (66) between the limits t_0 and t_1,

$$(67)\quad T_1 - T_0 = \sum_r\int_{t_0}^{t_1}(X_rdx_r + Y_rdy_r + Z_rdz_r),$$

where T_0 and T_1 denote the values of T at the respective instants t_0 and t_1.

The integral on the right is the work (14) done by all the applied forces during the motion. We thus obtain the principle that *the increase of kinetic energy of a system is equal to the work done by the forces.* Suppose now that the system be taken from one given configuration, where all the coordinates have given values, to a second, where they have other given values, the particles describing given paths, and they then be taken from the same initial configuration to the same terminal one, but by other paths. Two cases are to be considered. Either the work done by the forces depends upon the paths, or it is independent of the paths, depending only on the terminal configurations. If the integral

$$\int_{t_0}^{t_1}(X_rdx_r + Y_rdy_r + Z_rdz_r)$$

does not depend upon the path, it can be shown that every component of every force is the partial derivative of a single function $-W$ of all the coordinates, by the corresponding coordinates.

$$(68)\quad X_r = -\frac{\partial W}{\partial x_r},\quad Y_r = -\frac{\partial W}{\partial y_r},\quad Z_r = -\frac{\partial W}{\partial z_r}.$$

We then have

$$\sum_r\int_{t_0}^{t_1}(X_rdx_r + Y_rdy_r + Z_rdz_r) = W_0 - W_1,$$

and the equation (67) becomes

$$T_1 - T_0 = W_0 - W_1,$$

or

$$(69)\quad T_1 + W_1 = T_0 + W_0.$$

The sum of the two functions $T + W$ is then constant during the motion. As T is called the kinetic, W is called the *potential energy* of the system. Such systems are called *conservative systems*, and the above principle is called the principle of the *Conservation of Energy.* The notion of energy is of the greatest importance in dynamics. The principle was first used by Huygens and was generally stated by John and Daniel Bernoulli.

As an example of a conservative force we may take gravity. For a single particle we have $W = mgz$ (z being measured upward), so that the equation of energy is

$$\tfrac{1}{2}mv^2 + mgz = \text{const.} = \tfrac{1}{2}mv_0^2 + mgz_0,$$
$$v^2 - v_0^2 = 2g(z_0 - z) = 2gh.$$

Accordingly the velocity attained by a falling particle does not depend on the form of the path, but only on the height fallen. This was known to Galileo, for bodies falling along the inclined plane or the arc of a circle. Forces acting according to the Newtonian law are also conservative.

We have now stated in summary fashion the principal theorems of *Mechanics.*—The scope of this article does not permit us to enter into the details of the various methods which arise for treating the more complicated problems, say of the motion of a rigid body. By means of the equations (65), however, we may form an idea of some of the properties of such motions. We have seen that the center of mass moves as if the whole body were concentrated, and all the forces applied there. To find the motion of rotation we have to investigate the moment of momentum of a rigid body. If the body rotate about an axis with angular velocity $d\theta$, we obtain the velocity of a point at a distance r from the axis by differentiating the equations $x = r \cos \theta$, $y = r \sin \theta$,

$$v_x = -r \sin \theta \frac{d\theta}{dt} = -y\frac{d\theta}{dt}, \quad v_y = r \cos \theta \frac{d\theta}{dt} = x\frac{d\theta}{dt},$$

and the moment of momentum is

$$H_z = \sum_r m_r(x_r v_{yr} - y_r v_{xr}) = \frac{d\theta}{dt}\sum_r m_r(x_r^2 + y_r^2).$$

The quantity $K = \Sigma_r m_r(x_r^2 + y_r^2) = \Sigma_r m_r r_r^2$ is called the *moment of inertia* of the body with respect to the axis. Suppose the axis is horizontal, and the body influenced only by gravity. The resultant of the weights of all the particles of the body is a force $W = Mg$ applied at the center of mass, which is, say, at a distance h from the axis, the plane through it and the axis making an angle θ with the vertical. Then the moment of all these forces about the axis is $N = Mgh \sin \theta$, and we have the equation of motion

$$\frac{dH_z}{dt} = K\frac{d^2\theta}{dt^2} = -Mgh \sin \theta. \tag{70}$$

This is the same as that of a simple pendulum of length $l = K/Mh$, which is called the length of the equivalent simple pendulum. A point at a distance l from the axis and in line with it and the center of mass is called the *center of oscillation*. This problem of the so-called compound pendulum was solved by Huygens, who also showed that if the body be suspended from a parallel axis through the center of oscillation the period would be the same.

If a rigid body move in any manner with one point fixed, it may be shown that its motion at any instant may be described as a rotation with a certain angular velocity about a certain axis. All the particles of the body are then moving in various directions tangent to circles with planes parallel to each other, but owing to lack of symmetry the direction of the resultant moment of momentum has no simple relation to the direction of the axis.

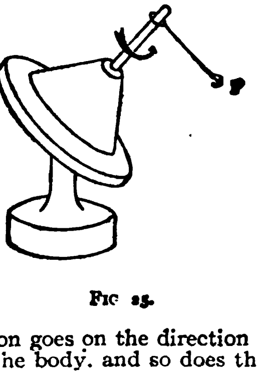

Fig 25.

As the motion goes on the direction of the axis changes in the body, and so does the direction of the moment of momentum. Thus the phenomenon is a complicated one, and can be dealt with only by lengthy analysis. If, however, the axis of rotation is an axis of symmetry, as in the case of the axis of a symmetrical top, Fig. 25, it is evident that the particles may be grouped in symmetrical pairs, m_1, m_2, Fig. 26, so that the moments of momentum H_1, H_2 about the fixed point O will be symmetrical with respect to the axis, and the resultant moment will be in the direction of the axis. If then we apply to the axis a force F (Fig. 25),

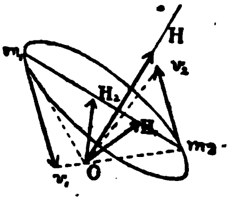

Fig. 26.

it will have a moment M (Fig. 27), perpendicular to the plane of F and the fixed point,

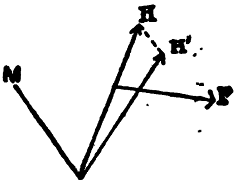

Fig. 27.

and according to equations (65) this will be the direction in which the vector H will move toward H'. The end of the axis will therefore move at right angles to the direction in which it is pulled. This is the basis of the explanation of the curious phenomena of all tops and gyroscopes. In the ordinary top, the weight acting downwards at the center of mass produces a horizontal moment; the point of the top accordingly begins to move horizontally, causing a movement of *precession*. When the precession begins, the rotation is no longer about the axis of symmetry, and the vector H no longer coincides with the geometrical axis of the top, but the end of the vector H always travels in a horizontal plane, and the axis of the top moves about it in a motion of so-called nutation. The rotary motions of the planets are explained in a smilar manner.

Bibliography.—The following treatises may be consulted for a more detailed treatment For the whole subject: Thomson and Tait, 'Treatise on Natural Philosophy'; Tait, 'Dynamics'; Webster, 'Dynamics'; Williamson and Tarleton, 'Dynamics'; Love, 'Theoretical Mechanics'; Ziwet, 'Theoretical Mechanics'. For various parts: Minchin, 'Treatise on Statics'; Routh, 'Analytical Statics'; Tait and Steele, 'Dynamics of a Particle'; Routh, 'Dynamics of a Particle'; Routh, 'Dynamics of a System of Rigid Bodies'; Mach, 'The Principles of Mechanics.'

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Mechanics of Development or Evolution. A term applied by German embryologists and biologists to the changes coincident with the reproduction, fertilization and later growth of organisms. In the organic world, living bodies are constantly undergoing changes of state, these changes being most conspicuous during the period of embryonic development. The changes in the conditions of life together with heredity and selection have caused the evolution of the world of plants and animals. These changes have been complex, and yet in every way have been made with exactness, order, and regularity, and the larger knowledge of developmental mechanics has in a great measure been due to the researches of Pander, Lotze, Born, Wilson, Loew, Ryder, Wyman, Driesch, and others. Probably the most noteworthy treatments, though of opposing schools, are those of Von Wilhelm Roux 'Programm und Forschungsmethoden der Entwichlungsmechanik der Organismen leichverständlich dargestellt' (Leipzig, 1897); and of Dr. Oscar Hertwig 'Zeit- und Streitfragen der Biologie: Mechanik und Biologie' (Jena, 1897). Nature does for man in the organic what he has to effect in the inorganic world, and it is only necessary that he observe these changes to be able to state a series of relations of antecedent and consequent. See LIFE; GROWTH; KINETOGENESIS.

Mechanics' Lien, in statute law, a lien or claim upon real estate to secure payment for work or labor performed on, or materials furnished for buildings or other improvements thereon; which labor or material has been furnished at the request or with the consent, express or implied, of the owner of such real estate or other property. In early English law lands were charged with liens by express agreement of the owner, and were generally covered by mortgages. Courts of equity also recognized mortgage agreements. By statute other liens were created, including judgment liens and liens for taxes and assessments. In the United States the increasing number of independent contractors who constructed buildings on contract, and of dealers in building material, resulted in the enactment of numerous mechanic lien laws. Such laws have also been enacted in Canada, but not in Great Britain. The statutes hold that the value of real estate is increased by the addition of improvements and that the property should accordingly be held subject to such claims. Mechanics' liens are valid prior liens over all other claims, such as mortgages, judgments or taxes, and the term covers all claims for labor, whether skilled or unskilled, and for all building materials furnished. But liens are held against the property and not personally against the owner. The lien only attaches to the very property upon which the work was done, and has no effect on other pieces of real estate of the owner. In most States the law provides that the work to which the owner is entitled under a contract must be entirely performed before the contractor can file a lien. The statutes of mechanics' liens vary in the different States in the matter of details, time of filing, method of procedure, etc., and State statutes should be consulted. See LIEN; MORTGAGE.

Mechanicsburg, mē-kăn'ĭks-bėrg, Pa., borough, in Cumberland County, on the Cumberland Valley railroad; about 10 miles west by south of Harrisburg. It was settled in 1806, and in 1828 was incorporated as a borough. It is situated in an agricultural region, in which there are large deposits of iron ore. The chief manufactures are foundry and machine-shop products, spokes and wheels, wagons and carriages. The borough is a distributing centre for the surrounding iron region, and a shipping point for a large quantity of iron ore. The Irving College (Lutheran) is located here. Pop. (1910) 4,469.

Mechanicsville, mẹ-kan'ĭks-vĭl, N. Y., village, in Saratoga County; on the Hudson River and the Champlain Canal, and on the Delaware & H., and Boston & M. R.R.'s; about 20 miles north of Albany. The water-power is extensive. Power is transmitted from Mechanicsville to manufacturing establishments in Schenectady. Some of the manufacturing establishments of Mechanicsville are knitting mills, sash and blind factories, paper and pulp mills, and machine shops. The village owns and operates the waterworks. Pop. (1890) 2,679; (1900) 4,695; (1910) 6,634.

Mechanicsville, Battle of (also called Battle of Beaver Dam Creek). After the battle of Oak Grove (q.v.). 25 June 1862, the Army of the Potomac was thrown upon the defensive by the sudden appearance of "Stonewall" Jackson on its right. North of the Chickahominy McClellan had but one corps in position, that of Fitz-John Porter, temporarily strengthened by McCall's division of Pennsylvania Reserves. McCall held the extreme right of the line at Mechanicsville and Beaver Dam Creek, with three brigades and five batteries of 26 guns. His main position was along the east bank of the creek, a tributary of the Chickahominy, and was very strong, his left resting on the Chickahominy, his right and advance extending to a body of woods near and overlooking Mechanicsville, held by a regiment and a battery. Rifle-pits had been constructed for the infantry, epaulments had been thrown up to cover the guns, and a strong picket-line was in front from Mechanicsville Bridge to Meadow Bridge along the Chickahominy. A. P. Hill's Confederate division and Cobb's Legion were in plain view from the left, intrenched on the opposite side of the Chickahominy. About noon of the 26th Hill's men were seen in motion. At 12:30 the Union pickets at Meadow Bridge were driven in, and McCall formed line; Reynolds' brigade on the right, covering the crossing of the road from Mechanicsville to Bethesda Church; Seymour on the left, covering at Ellerson's Mill the crossing of the road from Mechanicsville to Gaines' Mill; and Meade's brigade, with two batteries in reserve. A. P. Hill had 14,000 men in his division, which he had concentrated near Meadow Bridge, under orders from Gen. Lee to co-operate with Jackson, who was marching from Ashland to turn McClellan's right. Hill sent Branch's brigade and a battery to cross the Chickahominy seven miles above Meadow Bridge and communicate with Jackson's advance, and when Jackson had crossed the Virginia Central Railroad, Branch was to cross the Chickahominy, push down the river and uncover Meadow Bridge, which Hill was to cross at once and then sweep down to Mechanicsville, uncovering in turn the Mechanicsville Bridge, which Longstreet's and D. H. Hill's divisions were to cross, when all were to push down the left bank of the Chickahominy and cut off McClellan's communications with his base at White House on the Pamunkey, and thus force him to abandon his operations against Richmond and retreat down the Peninsula. Jackson was behind his appointed time, and it was 10 o'clock before Branch opened communication with him. Hill grew impatient as the hours went by and nothing was heard from Branch or Jackson, and at 3 P.M. put his five brigades and six batteries in motion. Field's brigade seized Meadow Bridge and crossed, closely followed by the brigades of J. R. Anderson and Archer. The brigades of Gregg and Pender then crossed and marched across the country to support the right of the attacking column. Field's advance was met by a severe artillery fire; but, forming line, with Pegram's battery in the centre, it forced the Union advance of a regiment and battery from Mechanicsville back to the main line beyond Beaver Dam Creek. It had not been Gen. Lee's intention to attack McCall in position, but to have Jackson turn it. Jackson was not up in time; McClellan would doubtless penetrate his design and make a counter attack against Richmond; time was everything; the day was declining, and Lee ordered A. P. Hill to attack. The brigades of Field, Archer, and Anderson were ordered to advance on the Mechanicsville road against Reynolds. They were met by a withering fire of artillery and musketry, and were bloodily repulsed, though one of Anderson's regiments on the left succeeded in making a temporary lodgment beyond the creek. Parts of Porter's corps now came up and strengthened Reynolds' right. Following the repulse on the left, Pender's brigade and Ripley's of D. H. Hill's division made a most determined attack upon Seymour at Ellerson's Mill, but a millrace, swampy ground, and other obstacles were in their way, and Seymour's direct and Reynolds' flank fire checked and then repulsed them with great loss. The attack was renewed, and a still more bloody repulse was the result, some of the regiments losing all their field officers and half their men. It was now sunset, and no further effort was made to assault the position, but the firing was kept up until 9 P.M. On the next morning McCall was ordered to fall back to Gaines' Mill (q.v.). The Union loss was 49 killed, 207 wounded, and 105 missing. The Confederate loss, killed and wounded, was over 1,500; Longstreet says between 3,000 and 4,000 killed, wounded, and missing, which is probably excessive. Longstreet further says: «Next to Malvern Hill, the [Confederate] sacrifice at Beaver Dam was unequaled in demoralization during the entire summer.» Consult 'Official Records,' Vol. XI.; 'McClellan's Own Story'; Webb, 'The Peninsula'; Allan, 'History of the Army of Northern Virginia'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. II. E. A. CARMAN.

Mechanism, or the **Mechanical Theory,** in its most general significance, means the relation of a limited number of invariable substances to each other in such a way that they vary in their relations according to invariable laws. More specifically it means the explanation of phenomena by the universal laws of matter in motion. It is closely connected with the attempt to resolve bodies into their simplest elements and to explain their qualities as due to uniform laws of connection and interaction among these elements. The mechanical theory has usually been held in connection with some form of atomism (q.v.). Since the aim of this kind of explanation is to reduce qualitative determinations to quantitative and mechanical relations of elements, these elements have usually been conceived to possess only such qualities as were necessary to explain the empirical qualities, the ideal being to find a single homogeneous element possessing only the characteristics essential to corporeity. The term mechanical is also used in a looser sense, though still within the limits of the general definition given above, to describe any explanation which regards all the qualities of a body as due to the mere summation of the qualities of its parts; *e.g.*, a mechanical theory of society.

Mechanism as a Theory of the World.—As a philosophical theory, mechanism is the attempt to regard the entire universe as a closed system of causes and effects in which every change is ultimately reducible to a change of motion. In this sense, therefore, it is practically synonymous with materialism (q.v.). It involves the entire elimination of teleology or final causes as a principle of explanation and the denial of any intelligent agency in natural phenomena. To be consistent it must attempt to explain all vital and psychic phenomena as due solely to mechanical forces. Such a theory of the universe appeared very early in the history of thought. It was first consistently developed in Greek philosophy by Democritus (c. 460-c. 357 B.C.) (q.v.), who taught that the only realities are atoms and empty space. Bodies vary only in the size, number, figure, and arrangement of the atoms which compose them. The atoms are qualitatively alike and act on each other only by pressure or collision. Every event takes place through a necessary cause. The atomistic philosophy was continued by the Epicureans, though for ethical and not for practical reasons. With the ascendency of Aristotle during the Middle Ages, the mechanical view of the world fell into abeyance, but as a consequence of the renascence of physical science, it was revived in modern times, first by Gassendi (1592-1655) (q.v.), and somewhat later by Hobbes (1588-1679) (q.v.). The latter constructed a complete and consistent theory of materialism in which he subjected to mechanical explanation not only external nature but also the phenomena of the human mind. The whole empirical universe is, for Hobbes, a manifestation of motion, which is the underlying reality. Consistent theories of materialism were held in France by La Mettrie (1709-1751), Baron d'Holbach (1723-1789), and Cabanis (1757-1808). The philosophical refutation of materialism was given by Kant (1724-1804) (q.v.) when he proved that in all experience the nature of the knowing mind itself is a determining factor and that it is therefore vain to seek in experience for knowledge of a reality which by hypothesis is unrelated to mind.

Mechanism as a Method of Explanation.—After the Middle Ages the development of the new science, at the hands of Copernicus, Kepler, and Galileo (qq.v.), and many of their contemporaries, depended very largely on the application to nature of the method of mechanical explanation. Francis Bacon (1561-1626) (q.v.), by his opposition to the use of teleology in scientific explanation, did much to bring about the acceptance of mechanism, and it was firmly established as the true scientific method of dealing with nature by Descartes (1596-1650) (q.v.), who, though not an atomist, still denied to matter all but quantitative characteristics and defined the method of science as strictly mechanical. Even the physical phenomena of living bodies (everything in the world, in fact, except the *res cogitans* in man) he regarded as capable of a purely mechanical explanation. From this time on mechanism became the recognized method for natural science, and consequently it soon became an urgent philosophical problem to discover a satisfactory way of reconciling the mechanical conception of nature with a teleological and idealistic conception of the universe. Thus Leibniz (1646-1716) (q.v.), while admitting the necessity of reducing all natural phenomena to motion, held that ultimate reality consists of an infinity of centers of force (monads), which he conceives as in some sense analogous to minds. Accordingly, metaphysical explanation must be in terms of teleology, though mechanism is the sole valid explanation of the phenomenal manifestation of reality in nature. A similar conception, having its historical origin in Leibniz, was held in the 19th century by Lotze (1817-1881) (q.v.), who proclaims the purpose of his philosophy to be «to show how absolutely universal is the range of mechanism. and at the same time how completely subordinate the significance of the function which it has to fulfil in the structure of the world» ('Microcosmus,' Introduction). Kant also regards the mechanical categories as the sole valid means of scientific explanation. The causal category is, for him, rigorously constitutive of our experience and hence is determinant of our conception of all objects in the world of experience; teleology, on the other hand, though a necessary means of regulating our investigations of organized matter, remains a merely subjective principle which can give no insight into the origin of any being. When we deal with objects which «cannot be thought by us, as regards their possibility, according to the principle of mechanism,» we may treat them «as if» they were teleologically ordered; but «nothing is gained for the theory of nature or the mechanical explanation of its phenomena by means of its effective causes, by considering them as connected according to the relation of purposes.» The phenomena of the moral life, according to Kant, lie outside the realm of scientific experience and hence are not subject to mechanical explanation. Since Kant's time, many thinkers, perhaps the majority, have followed him in regarding mechanism as the ultimate principle of explanation for science; thus Helmholtz, F. A. Lange, Dubois-Reymond, Clausius, Thomson, Maxwell, etc. Wundt attempts to find for it a logical justification as the only theory which can afford an adequate conception of natural causality. On the other hand, more recent writers, especially among physicists, have taken the opposite view. According to them, the preëminence of mechanical explanation is merely a dogma based on its successful use in science. E. Mach, Stallo, Helm, and H. Cornelius take this position. These thinkers maintain that the purpose of scientific explanation is to condense into a single compact statement (*e.g.*, a mathematical formula) a large mass of empirical data. A scientific law is merely a shorthand statement of the facts, and its value is purely economic. So long as the mechanical theory affords useful analogues for the formulation of other phenomena, it is a valid scientific method. Whenever this ceases to be the case, mechanism must be superseded by a more economical theory. Kant's conception of mechanism as a mode of dealing with experience, has been developed by contemporary English idealism. The general problem of all rational knowledge is conceived to be the construction and maintenance of a coherent and systematic experience. In all thought, therefore, there is implied a totality which constitutes the truth. But this totality manifests itself in different categories of thought and in varying degrees of perfection. «Matter and motion are the abstractions in which the sensuous world is reduced to homogeneity in order to be susceptible of quantitative treatment, and in this treatment they are able to a large extent to represent genuine and actual relations of that world» (Bosanquet, 'Logic,' Vol. I, p. 200). Mechanical explanation, therefore, is one form in which the unity of thought may be manifested; it is «that form of identity and difference in which an identity is regarded as the sum of the differences in which it is presented» (*Ibid.*, p. 201). Its value for knowledge is therefore said to be instrumental or methodological, because it is a method which thought uses in its effort to construct a rational experience. It possesses ultimate truth just in proportion to the degree of rational unity which it achieves in experience as a whole.

In biology the term mechanism is used, in contrast with vitalism, to indicate a theory which attempts to explain all vital phenomena by chemico-physical processes, strictly from the point of view of cause and effect, without appealing to a teleological principle of explanation. The term «Developmental Mechanics» has been proposed by Roux as a name for that department of biology which investigates experimentally the development of the individual organism, conceived as standing in more or less mechanical relations with the environment. Consult Roux's 'Problems, Methods, and Scope of Developmental Mechanics' (Lectures Delivered at the Marine Biological Laboratory of Wood's Holl in the Summer Session of 1894, pp. 149 ff.).

In psychology the term mechanism is sometimes used to describe a theory which seeks to explain mental phenomena as due to the combination or interaction of simple psychic elements. This usage is an analogy with the atomic theory of matter. The classical example is Herbart (q.v.), who gave the term currency. According to his theory, every representation has a constant quality and a variable force. These forces stand in relations of greater or less opposition and the whole state of consciousness is conceived as a resultant of all the forces involved in it. Consult Th. Ribot's 'German Psychology of To-day' (Eng. trans. by J. M. Baldwin, pp. 24 ff.).

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Mechitarists, mĕk-ĭ-tär'ĭsts. a sect of Armenian Christians acknowledging the authority of the pope, but retaining their own ritual. The name originated from Mechitar Da Petro, who in 1701 founded a religious society at Constantinople for disseminating a knowledge of Armenian literature. They soon removed to the Morea, whence in 1715 they went to Venice, and later to the island of San Lazzaro.

Mechlin, mĕk'lin (Dutch, mĕн'lĭn). or **Malines,** mä-lēn, Belgium. a city on the Dyle, 14 miles southeast of Antwerp. The ancient walls and moat have been replaced by a wide boulevard and canal, the streets are wide and regular. and it has fine squares and public buildings. It is the see of the Primate of Belgium and has numerous churches. St. Rombold's Cathedral, a vast building covering nearly two acres, was built in 1437-52; the clock-tower, however, 324 feet high, remains unfinished; the cathedral contains Van Dyck's 'Crucifixion.' The churches of St. John and Our Lady contain works by Rubens; the town hall dates from the 15th century; the Cloth Hall, now used as a guardhouse, from 1340, while also noteworthy are the modern archiepiscopal palace, the Beguinage, and the Salm Inn (1534). The manufacture of pillow lace and of cloth, so famous in the 15th, 16th, and 17th centuries, has been largely transferred to Brussels; the chief industries now are carpentry, cabinet making, brewing. horticulture, and agriculture; extensive railway works have been established here.

Mecklenburg, mĕk'lĕn-boorg, Germany, a territory on the Baltic Sea, a former Saxon province, now divided into the grand-duchies of MECKENBURG-SCHWERIN and MECKLENBURG-STRELITZ.

(1) Mecklenburg-Schwerin, bounded on the north by the Baltic Sea, elsewhere chiefly by Prussia and Mecklenburg-Strelitz, has an area of 5,135 square miles. The capital is Schwerin. Pop. about 610,000. Mecklenburg-Schwerin is watered by several rivers, most important of which are the Elbe and its tributaries, the New Elde and the Sude, on the southern border, the Warnow, the Recknitz and the Stepenitz, which flow toward the Baltic. There are many lakes and ponds, the largest of which are the Müritz See (51 square miles), the Schweriner See (23 square miles), the Kölpiner, and the Plauer See. The country is generally flat, though here and there intersected by low ranges of hills, and its surface is extensively covered with wood. Near the sea are large tracts of sand and morass. The climate, though raw, is mild and healthful; the average temperature throughout the year is 46° and the precipitation is 21 inches.

The principal industries are agriculture, dairying, and stock-raising. The chief crops are wheat, rye. oats, barley, corn, pease, beans, beets, turnips, and potatoes, and tobacco is cultivated to some extent. The principal manufacturing industries are foundries, machine shops, brick yards, tanneries, paper mills, sugar refineries, breweries, distilleries, tobacco factories, etc. There is considerable commerce through Warnemünde (Rostock) and Wismar.

The predominating form of religion is the Lutheran. Besides the University at Rostock there are several gymnasia, and numerous burgher, parochial, and other schools. The two Mecklenburg duchies have a common assembly or Landesunion, consisting of the representatives of the landed aristocracy or Ritterschaft and the burgomasters of 49 towns; the tenants of the royal domains have no representation. The assembly meets once a year, alternately at Malchin and Sternberg. The executive authority in Mecklenburg-Schwerin is vested in a cabinet of four ministers; there are also a permanent committee consisting of nine members at Rostock, who represent the two estates when the assembly is not in session, and deputation and convocation diets, which may be assembled upon special occasions and for special purposes. Mecklenburg-Schwerin has two votes in the federal council, and six representatives in the Reichstag. Each duchy has a separate system of lower courts but they have a supreme court at Rostock in common. There is no general financial budget for Mecklenburg-Schwerin; there are three entirely distinct systems of finance. The budget of the first system is called the administration of the sovereign; the second, the states administration, and the third the ordinary budget of the common administration.

(2) Mecklenburg-Strelitz, divided by Mecklenburg-Schwerin into two large districts, the circle or lordship of Stargard. and the principality of Ratzeburg, both on the east, and on the west in several smaller districts, existing in separate patches, has an area of 1,131 square miles. Pop. (1900) 102,628; capital Neustrelitz. The country is flat and similar in physical characteristics to Schwerin. Strelitz has one joint representative chamber with Schwerin, but Ratzeburg is not included in these estates, and is governed directly by the grand duke. The grand duke gave Ratzeburg a representative constitution 1869. Mecklenburg-Strelitz has one vote in the federal council of the empire, and one representative in the diet.

Mecklenburg (mĕk'lĕn-bėrg) **County,** N. C. The story of Mecklenburg County in North Carolina involves a story of three races of people, namely. the Indian, the white man, and the negro. Without ever having a definite purpose to do so the white man drove out the Indian. Having always a definite purpose to Christianize and civilize the Indian, the white race, contrary to its purpose. exterminated the red race. This was accomplished in effect in the first half of the 18th century. The early white settlers were mainly Scotch, Irish, German, and English. The first vocations of the white settlers were in the main agriculture, but from the first settlements such arts as smithing, wheel-wrighting, spinning, and weaving were practised. These and other primitive manufactures were rapidly developed and enlarged. In the second half of the 18th century the Piedmont region of the South became more flourishing in manufactures than any other part of the Union. Blast furnaces, rolling mills, machine shops, woolen factories, cotton factories, hat factories, wagon and carriage factories, gun shops and many other manufacturing interests grew in numbers and importance. The colonists built to great prosperity. They felt hampered by restrictions of the king and parliament in England. They resisted these restrictions. Increasing discontent made increased resistance. On 20 May 1775 a convention of Mecklenburg County met in Charlotte and made a declaration of Independence of the King. On 31 May following a series of resolutions were passed defining a method of government of the county by its own people.

In 1793 Whitney of New Haven, Conn., invented the cotton gin. In 1795 Holmes of Hamburg, S. C., improved the Whitney gin by introducing saws in place of wire spikes, making it practical. In 1800 the gin had become generally introduced into Mecklenburg County. From this time forward manufactures diminished in importance, while agriculture in the form of cotton production increased in importance. Here the third race, the negro, became a factor of growing importance. Slaves were brought from Northern States to put in the cotton fields and also imported from Africa. Agriculture with slave labor became of more and more importance, while manufactures and commerce became of less and less importance. By 1830 the county had become wholly one of agriculture, and slavery had become dominant. The former skilled white labor emigrated largely to what was then the Northwest Territory. Another tide of emigration turned to the Southwest, where land could be found to further employ slave labor in the production of cotton, rice and sugar. Immigration of white people stopped. The white labor left were relegated to farms more or less exhausted by unscientific agriculture and these became what some people called the «poor whites» of the South.

Civilization demanded the abolition of slavery. Slaveholders opposed this and controlled a following which postponed the event and tended to isolate the territory in which slavery was the controlling influence. Constant pressure of the subject brought Secession, the War, abolition. The Civil War was destructive. The fall of slavery was more destructive. The investment of freedmen with franchise and other privileges to which they were wholly unaccustomed and for which the race was, at least at that time, unfit, brought a period of semi-anarchy. On the re-establishment of good government manufactures which had languished throughout the period of slavery were re-established. Commerce revived. A system of public education was established. Emigration ceased. Immigration set in again. Before the time of slavery the county made great progress. During the time of slavery the county stood still. After the time of slavery the county again makes great progress.

Some of the principal events of the county have been the following:

First White Settlements, 1720.
Creation of Mecklenburg County, 1762.
Declaration of Independence, 20 May 1775.
Beginning of Charlotte, 1765.
Andrew Jackson born, 15 March 1767.
James Knox Polk born, 2 Nov. 1795.
United States Mint, branch mint established 1837.
Macadam Road Building begun 1884.
First Cotton Mill, 1881.
First Cottonseed-oil Mill, 1882.

D. A. Tompkins.

Mecklenburg (mĕk'lĕn-bėrg) **Declaration,** in American history, a series of rebellious resolutions adopted 20 May 1775, at Charlotte, Mecklenburg County, N. C., by a convention held at midnight, and representing each militia company in the county. The resolutions declared that the people of Mecklenburg County were free and independent of the British crown, and not only was the general tenor that of the Declaration of Independence, but many phrases in the resolutions are word for word as they appear in that document. The minutes of the midnight meeting are said to have been destroyed by fire in 1800. Whether the Declaration of Independence followed the words of the Mecklenburg Declaration, or whether the latter, having probably been replaced from memory, was tinctured with the former, is a disputed question. Consult Cooke, 'Revolutionary History of North Carolina' (1853); Draper, 'The Mecklenburg Declaration' (1874).

Mecon'ic Acid, an organic acid occurring in opium, and having the formula $C_5HO_2(OH)(COOH)_2$. In preparing it, the opium is exhausted with water at 100° F., the infusion is neutralized with calcium carbonate and evaporated to a syrup, and calcium meconate is precipitated by adding a concentrated solution of calcium chloride. Two crystallizations from hot dilute hydrochloric acid follow, and the free acid is then deposited in the form of small scales, containing three molecules of water. Upon heating to 212° F. the hydrated crystals lose their water, and become white. Meconic acid is readily soluble in alcohol, but only slightly so in ether and in cold water. It has a sour taste and a pronounced acid reaction, and its solutions are turned red by ferric chloride, $FeCl_3$. Meconic acid forms numerous salts («meconates»), as well as various organic derivatives; but none of these is of importance in the arts.

Medal, a piece of metal in the form of a coin, stamped with a figure or device to preserve the portrait of some eminent person, or the memory of some illustrious action or event. Medals belong to two periods, ancient and modern, separated by a wide interval. Early Greek and Roman medals were struck for prizes in athletic games, or in commemoration of great events. The Roman series of medals or medallions is very extensive in gold, silver and brass or copper. The gold medals begin with Constantine and continue to the fall of the empire; the silver begin under Gallienus and continue as long; the copper from Augustus to Alexander Severus.

In more modern times the art of medal-making has been brought to great perfection, and most of the principal nations have adopted the plan of preserving their history by these durable monuments. The French series is deserving of special mention as the most perfect and complete in the world. It commences under Louis XI., and continues to the present date, illustrating every important event in the history of France. The English series commences under Henry VIII., but as works of art the medals have not high rank. The British battle medals, however, form an admirable series. The Italian and German medals of modern date are very fine. The mediæval are interesting and bold in design, but rude in execution. The papal series, commencing with Paul V., are worthy of attention.

One of the earliest American medals is that presented to General John Armstrong for his successful attack in 1756 on the Indians at Kittanning. Most of those struck during the Revolution were made in France. The next American medal of which there appears to be any record is that which was presented to General Gates after the surrender of Burgoyne, 17 Oct. 1777. On 25 March 1776, when news of the British evacuation of Boston reached Congress, that body resolved that its thanks be presented to the Commander-in-Chief, and that a gold medal be struck in commemoration of the event. This medal was nearly two and three quarter inches in diameter. On one side was a profile head of Washington, with the legend in Latin: «The American Congress to George Washington, the Commander-in-Chief of its armies, the assertor of freedom.» On the reverse the device showed troops advancing toward a town, others marching toward the water, ships in view, General Washington in front, mounted, with his staff, whose attention he is directing to the embarking enemy. The legend is: «The enemy for the first time put to flight.» Then, too, at the time of his death, among minor honors paid to the great general's memory, was the publishing of a silver commemorative medal.

There is the record of one medal only granted by Congress in commemoration of any naval victory during the War of the Revolution, and that was a gold one presented to Paul Jones for his defeat of the British frigate Serapis when commanding the Bonhomme Richard, 23 Sept. 1779. Other gold medals were those presented to Commodore Perry and Lieutenant Jesse D. Elliot for the part which they took in the battle of Lake Erie, 8 Oct. 1812; to Captain Lawrence, who, in command of the Hornet, 24 Feb. 1813, captured the British brig Peacock; to Captain Warrington of the Peacock — then under the Stars and Stripes — for the capture of the Epervier, 20 April 1814; to Captain Thomas Macdonough, who commanded the American squadron in Plattsburg Bay, August 1814; to Captain Decatur, who, in command of the United States, captured the British frigate Macedonian, 25 Oct. 1812; and to Captain Jones and Captain Blakely, who, when commanding the Wasp — the one, 12 Oct. 1812, and the other 28 June 1814 — captured respectively the Frolic and the Reindeer from the British navy.

The giving of medals went out of fashion after the second war with Great Britain, and but little was done by the government during the War of the Rebellion. Major Robert Anderson received two medals for his gallant defense of Fort Sumter, but one was presented by the citizens of New York and the second by the Chamber of Commerce of the same city. After the successful operations by Grant in East Tennessee and at Chattanooga, Congress voted him thanks and a gold medal with suitable emblems, devices and inscriptions. It is worthy of remark that no less than 189 medals were struck in honor of Abraham Lincoln, and later medals have been issued in memory of Garfield and McKinley, and in honor of Sampson, Schley, Dewey, and others in the Spanish-American War. See also COINAGE; NUMISMATICS; TOKENS.

WILL M. CLEMENS.

Medal of Honor, United States Military, an honor bestowed upon army and navy officers and men for specific services; regarded as a higher token of the war hero than the Victoria Cross of England, the medal of the Legion of Honor of France, or the Iron Cross of Germany. It is given not for the sheer performance of duty, no matter how hazardous that duty may be, but for some voluntary act of valor, beyond the bounds of mere obedience to orders. Out of the 5,000,000 men who have battled for the United States in the different wars this country has had, the vast majority, as history shows, performed their duty. Out of these 5,000,000, however, have been 2,000 men who have done more, who have braved dangers when they were not expected to brave them, overcome difficulties that were regarded by the rest as insurmountable, and faced death when it seemed it meant the sacrifice of their own lives. Many are the ways these medals have been won. By the Act of 12 July 1862 the United States government authorized the striking of 2,000 medals to be given to non-commissioned officers and privates for gallantry in action and soldier-like qualities. On 3 March 1863 the sum of $20,000 was appropriated for making the medals, and officers were made eligible to receive them. Medals were also authorized by Congress in recognition of acts of bravery performed (during the war with Spain in 1898) in the naval battles of Manila and Santiago, the Manila medals bearing the portrait of Admiral Dewey, and the Santiago medals a portrait of Rear-Admiral Sampson. The medal is a bronze five-pointed star within a circle of stars, suspended by a trophy of two crossed cannons surmounted by an eagle, united by a ribbon of 13 stripes of red, white and blue.

Medal of Honor Legion, an association of officers and enlisted men of the Union army, who during the Civil War were awarded medals of honor for special acts of bravery and devotion. The association has 1,000 members among the army veterans and 200 among naval veterans. The meetings are held annually.

Medallion, mē-dăl'yŏn. (1) The term medallion in numismatics is applied to those productions of the mint of ancient Rome, or struck in the provinces under the empire, which, if gold, exceed the *aureus* in size; if silver, the *denarius;* and if copper, the first or large brass. Medallions are not numerous. Those struck in the Greek provinces are more common than the Roman, but of inferior workmanship. A beautiful and famous gold medallion exists of Augustus, and one of Domitian, but few, in any metal, are found prior to the reigns of Hadrian and Antonine; those in brass are the largest, many of them being several inches in diameter, and for the most part of admirable workmanship. (See MEDALS.)

(2) In architecture, an oval panel carved in bas-relief. The same term is used for a color design.

Medano, mā-dä'nō, the Spanish name for peculiar moving sand-hills in Peru. They are seen on the plain of Islay near Arequipa, and are crescent-shaped bodies of white sand, which move across the desert in the direction of the winds which blow from sunrise to sunset. The sand composing the medano seems different from the desert sands over which the moving mass is blown or carried.

Medary, Samuel, American editor and politician: b. Montgomery Square, Montgomery County, Pa., 25 Feb. 1801; d. Columbus, Ohio, 7 Nov. 1864. In 1825 he settled at Batavia, Clermont County, Ohio, and in 1828 established the 'Ohio Sun' in support of Jackson's candidacy for the presidency. He sat for Clermont County in the State house of representatives in 1834–5, and was a member of the State senate in 1835–7. In 1837 he purchased at Columbus the 'Western Hemisphere,' later the 'Ohio Statesman,' which he edited until 1857. In 1857–8 he was governor of Minnesota territory, and in 1858–9 of Kansas territory. He established the 'Crisis' at Columbus in 1860, and was its editor until his death. He gave active aid to Morse in the promotion of the electric telegraph, was a firm supporter of the measures of Jackson and Douglas; is said to have originated the battle-cry «Fifty-four forty, or fight!» in connection with the Oregon boundary dispute; and was often called the «old wheelhorse of Democracy.»

Medea, mẹ-dē'ạ, a powerful sorceress of the Greek heroic age, daughter of Æetes, king of Colchis. By some her mother is said to have been Idyia, daughter of Oceanus; by others Hecate or Neæra. By her profound knowledge of the magical virtues of plants she practised witchcraft. She became the wife of Jason (q.v.), the leader of the Argonauts. For 10 years she lived with him after having supported him in every danger, till the charms of Glauce, or Creusa, the daughter of King Creon, kindled a new passion in him, and he discarded Medea, who brooded on revenge. With this purpose she sent the bride, as a wedding gift, a poisoned garment, also a poisoned crown of gold, which Glauce put on and died in agony. The sorceress reduced Creon's palace to ashes by a shower of fire, murdered her two children by Jason, and then mounted her dragon chariot and escaped. Some say that she went to Hercules, others to Athens, to King Ægeus, by whom she had Medus. From Athens also she was banished as a sorceress. She finally returned to her home, where her son Medus reinstated her father, who had been dethroned by his brother Perses, after which she died. The story of Medea has often been a subject of tragic poetry ancient and modern. The tragedies of this name, by Æschylus and Ennius, have perished, as well as the Colchides of Sophocles. The Medeas of Euripides and Seneca are alone extant. The story has also been dramatized by Corneille and Grillparzer. Cherubini made this myth the subject of an opera.

Medellin, mā-dĕl-yēn', Colombia, Central America, a city, the capital of the department of Antioquia, and an episcopal see, picturesquely situated in a mountain valley 4,850 feet above sea-level on the Porce, an affluent of the Canca, 150 miles northwest of Bogota. It was founded in 1674, and has a cathedral, college, seminary, technical school, mint, hospital, and other public buildings. The development of the gold and silver mines in the region has contributed largely to its modern progress. It has manufactures of pottery, porcelain ware and jewelry, and has a considerable trade, exporting gold, silver, coffee, and hides.

Medford, mĕd'fōrd, Mass., city, in Middlesex County; on the Mystic River, and on the Boston & Maine railroad; five miles northwest of Boston. The area is about 10 square miles. It was founded in 1630 by people from Salem who called the place Meadford. In 1892 it was chartered as a city having within its limits the villages of South Medford, West Medford, Hillside, Glenwood, and Wellington. It is a residential suburb of Boston, but it has some important industrial interests, chief of which are the manufacturing of machinery, cotton goods, dyes, rum, chemicals, carriages, brick, and novelties. It is the seat of Tufts College (q.v.), and has the city and the college libraries. The Cradock House, built in 1634, is one of the oldest, if not the oldest building in the United States which retains its original form. The city has four large and several small parks. Oak Grove, the largest of its three cemeteries, has an area of 34 acres.

The charter granted in 1892 is still in force and provides for the administration of the municipality by a mayor, who holds office two years, and a board of aldermen composed of 21 members. The administrative officials are appointed by the mayor or elected by the council. The board of education is chosen by popular vote. Pop. (1890) 11,079; (1900) 18,244; (1910) 23,150. Consult: Usher, 'History of the Town of Medford, Mass.'

Medford, Wis., city, county-seat of Taylor County, on the Black River, and on the Wisconsin Central railroad; about 60 miles northeast of Eau Claire. It is in an agricultural and lumbering region. The chief manufactures are cheese, foundry products, lumber, and leather. It has considerable trade in lumber, leather, and cheese. Pop. (1910) 1,846.

Medhurst, mĕd'hērst, **Walter Henry,** English oriental scholar and missionary: b. London 1796; d. there 24 Jan. 1857. He was educated for the ministry, and in 1816 made a missionary tour through India and Malacca, establishing himself in 1822 in the island of Java, where he remained eight years. During this interval and for several years afterward he pursued his missionary labors also in Borneo and on the coasts of China. In 1843 he settled in Shanghai and subsequently passed six years in the interior of China. He was an intelligent student of the languages and literatures of eastern Asia, being well versed in the Chinese, Japanese, Javanese, and other dialects, beside Dutch, French, and English, in all of which he wrote. Beside a Chinese version of the Bible, he published 'Chinese Repository' (20 vols. 1838–51); 'Chinese and English Dictionary' (1842–3); 'English and Chinese Dictionary' (1847–8); 'English and Japanese Vocabulary' (1830); 'Dictionary of the Hokkien Dialect' (1832–9); 'Translation of a Comparative Vocabulary of the Languages of China, Corea, and Japan' (1835); 'Notes on Chinese Grammar' (1842); 'Chinese Dialogues' (1844); 'China in its State and Prospects' (1838); etc.

Media, mē'dĭ-ạ, Asia, an ancient kingdom and country of considerable extent, now comprised in the provinces of northwest Persia. It was originally inhabited by a Turanian race, who are called Medes by ancient writers; but this name properly belongs to an Aryan race, who had spread themselves widely in the high regions of Western Asia, and ultimately established their ascendency in Media. They have been traced both by Persian and Indian traditions to the countries beyond the Indus. The history of Media is involved in considerable obscurity, but careful modern investigations have made the main outlines fairly clear. The Medes are first mentioned in connection with some of the kings of Assyria from the 9th century B.C. Rammān-nirari II. of Assyria, who reigned about 810 B.C., led expeditions into Media, and in 713 the great King Sargon conquered the country and made the Median princes tributary to the Assyrian monarchy. According to the Assyrian inscriptions, one of the Median rulers named Dajaukku was carried off as a prisoner in 715 B.C.; this Dajaukku is the same as the Deioces who, according to Herodotus, founded the Median kingdom on an independent basis and fixed his capital at Ecbatana (now Hamadan) Deioces was followed by three kings in succession, bearing the names (in Greek) of Phraortes, Cyaxares, and Astyages. Phraortes, to whom the Greek historian assigns a reign of 22 years (647–625 B.C.), began the extension of the Median empire by the subjugation of the mountainous region of Persis, to the southeast of Media. He then conquered other parts of Asia, and at length ventured to take the aggressive against the Assyrians and attack Nineveh. In this attempt he failed and lost his life. Cyaxares succeeded him on the Median throne, and during a reign of 40 years raised his kingdom to the greatest power and importance it was destined to achieve. He thoroughly reorganized the army and advanced against Nineveh. He gained several successes, but before he could take the Assyrian capital he had to return to defend his kingdom against the inroads of Scythians. At first the Scythians carried all before them and became virtually masters of Media, but Cyaxares temporarily secured his position by negotiating with them, and finally slew all their chiefs when they were overpowered by wine at a feast. Thus rid of Scythian authority, Cyaxares again advanced aginst the Assyrians. In conjunction with Nabopolassar, founder of the Neo-Babylonian empire, he captured Nineveh about the year 606 B.C. After this event the Assyrian dominions were partitioned between the two conquerors, the northern parts falling to Media and the southern portions to Nabopolassar. Nebuchadrezzar, son and successor of Nabopolassar, married a daughter of Cyaxares. Cyaxares carried his arms into Asia Minor and waged war for five years against Alyattes, king of Lydia. On 28 May 585, the Median and Lydian forces were engaged in battle when a total eclipse of the sun took place and struck terror into the soldiers on both sides. This event disposed both sides to enter into peace negotiations, which were successfully carried through by the agency of Nebuchadrezzar and Syennesis, prince of Cilicia. Cyaxares probably died very shortly after this event, and left to his successor a greatly extended empire. Astyages was the last independent king of Media, and from 550 B.C., when he was conquered by Cyrus the Persian, Media formed part of the Persian empire.

Media, Pa., borough, county-seat of Delaware County; on the Philadelphia, Wilmington & Baltimore railroad; about 15 miles west of Philadelphia. It is a well-built, well-kept residential suburb of Philadelphia, and is situated in a fertile agricultural region. It is the headquarters for the Delaware County Institute of Science, established in 1833. The Institute has a library of about 5,500 volumes, and the borough library has about 3,500 volumes. The street-lighting plant and the waterworks are owned and operated by the borough. Pop. (1910) 3,562.

Me″diatiza′tion, a term applied especially to the process by which, on the dissolution of the German empire in 1806, the smaller princes who had depended immediately on the empire were subjected to the authority of the princes of the Confederation of the Rhine, and became *mediatized* or dependent members of that confederation, or otherwise became dependent upon more important German states.

Med′ical Association, American. See AMERICAN MEDICAL ASSOCIATION.

Medical Code, a set of regulations adopted by a medical association outlining the conduct of members of the profession. The various codes prohibit advertising in public prints, as well as the endorsement of proprietary or secret remedies. The ethics of both «regular» and homœopathic schools define the relations of patient and physician and of attending and consulting physician, and provide that a physician shall attend the immediate family of a brother physician without charge, except when unusual labor, expense, or exposure is involved. The medical code in this country was founded on the English code of medical ethics prepared by Thomas Percival in 1803. In 1847 the American Medical Association adopted a general code which superseded codes existing in several States, and which was unopposed till 1882. In the latter year a majority of the members of the New York County Medical Society voted to disobey the provision of the code which forbade them to consult with any but «regular» physicians, claiming the right to consult with any physicians that the legislature of each State decided to be legally qualified. Similar action was taken by a majority of the members of the New York Academy of Medicine. This antagonism affected the whole profession in this country, and the immediate result was the formation of New York county and State associations, whose delegates were received by the American Medical Association to the exclusion of those from the old societies. In 1903 steps were taken to heal their differences and unite the rivals into one body, with the code so modified in effect as to allow individual liberty in the matter of consultation. Consult Flint, ‹Medical Ethics and Etiquette› (1883).

Medical Colleges for Women. In the United States in 1910, over 700 women were students in the various medical colleges. In Philadelphia the Woman's Medical College of Pennsylvania, the only institution of the kind in this country, has met with marked success. In 1903, there had been to date a total graduation from this college of 244 students, and an effort was made to trace the careers of these graduates. Of this number 166 responded affirmatively to the question, Are you now engaged in active medical practice? Twenty-three responded in the negative, giving as reasons for the negative reply: Domestic duties, 8; philanthropic work, 1; ill health, 6; retired, 3; no reason assigned, 5. Seventy-six of the women replied stating the monetary value of their practice a year. Twenty-four made $1,000 a year or more, but less than $2,000; 20 as much as $2,000, and less than $3,000; 10 as much as $3,000 and less than $4,000; 5 as much as $4,000 and less than $5,000; 3 as much as $5,000 and less than $15,000. Four reported sums varying from $15,000 to $20,000 a year. Ten reported less than $1,000 a year. The average income was found to be $2,907.30. See also EDUCATION, PROFESSIONAL, IN AMERICA.

Medical Department, U. S. Army. See ARMY OF THE UNITED STATES.

Medical Department, U. S. Navy. See NAVY OF THE UNITED STATES, THE.

Medical Education. Before the establishment of medical schools in this country medical students either went abroad to study or served an apprenticeship with some practising physician. The latter custom was common in view of the expense incident to work abroad, and continued till very recently. As a rule the apprentice had little opportunity for study, but was forced to depend on what he could absorb by contact with his preceptor. The physicians of the 17th and 18th centuries who had studied abroad were usually classical students and in their preliminary training set an example that it would have been wise to follow. The first public lectures on anatomy before a class of students in this country are said to have been delivered by Dr. William Hunter of Newport, R. I., in 1752. It seems, however, that Dr. Giles Firmin as early as 1647 delivered readings on human osteology in New England; that Dr. Thomas Cadwallader of Philadelphia gave instruction to students in anatomy between 1745 and 1751; and that Drs. John Bard and Peter Middleton dissected the human body in New York city in 1750 for purposes of medical instruction. In 1762 Dr. William Shippen of Philadelphia gave a course of lectures on anatomy, illustrated by actual dissections. These lectures were continued till the organization of the Medical College of Philadelphia (now the medical department of the University of Pennsylvania) in 1765. Dissections were rarely performed prior to 1760 and even autopsies were seldom permitted. At the time of the American Revolution, with a population of 3,000,000, there were probably about 3,500 physicians in the colonies, of whom it is estimated that not more than 400 had received medical degrees. In New England the clergyman was often the only available physician. Two medical schools were organized in the Colonies, the Medical College of Philadelphia (now a department of the University of Pennsylvania) in 1765, and the medical department of King's (now Columbia) College, in 1768. The first medical degree conferred in this country, that of bachelor of medicine, was granted to 10 men by the Medical College of Philadelphia in 1768. The degree of doctor of medicine was first conferred in 1770 by the medical school of King's College on two students who had taken the bachelor's degree in 1769. Fifty-one medical degrees had been conferred by these institutions before 1776, when operations were suspended by the war. In the colonial period two medical societies (the State Medical Society of New Jersey, in 1766, and the Delaware State Medical Society, in 1776) and one permanent general hospital were organized. Harvard University Medical School was organized in 1782, Dartmouth Medical College in 1797, the School of Medicine of the University of Maryland and the College of Physicians and Surgeons of New York in 1807. In 1813 the medical department of Columbia College was finally discontinued; the College of Physicians and Surgeons took its place in 1860. Of the 148 medical schools now existing in the United States and registered by the University of the State of New York 3 were established between 1765 and 1800, 12 between 1801 and 1825, 19 between 1826 and 1850, 29 between 1851 and 1875, 80 between 1876 and 1900, 5 between 1901 and 1904.

At the time of the organization of the early medical schools the practice of obstetrics was relegated as a rule to ignorant midwives; physiology, histology, organic chemistry, pathology, and surgery, as now recognized, were hardly known. The schools at first conferred the degree of bachelor of medicine on those who had studied two years with a preceptor and attended one course of lectures, the degree of doctor of medicine after three years of study and two courses of lectures. The bachelor's degree was abandoned in 1813. At first the Medical College of Philadelphia required for admission some knowledge of Greek and Latin, physics, natural history, and botany, but the requirement was abandoned about the time of the reorganization of the University of Pennsylvania in 1792. For a century there were as a rule practically no requirements in preliminary general education for admission to medical schools, and even today this is their greatest defect.

In 1839 the New York State Medical Society resolved that teaching and licensing ought to be separated as far as possible. Further discussion of this question led to a convention of delegates from all medical schools and societies in the United States, held in New York in 1846; from it sprang the American Medical Association. This national organization, thoroughly representative in character, gave a new impetus to medical societies. The following societies have exercised an important influence in promoting higher standards: Association of American Medical Colleges (1890); American Institute of Homœopathy (1844); National Confederation of Eclectic Medical Colleges (1871); Southern Medical College Association (1892). These prescribe for admission to medical schools a preliminary general education equivalent to one year in a high school. All prescribe four courses of lectures in different years as a condition for an M.D. degree, though they give an allowance of one year to graduates of reputable literary colleges and of other professional schools. All tend to improve facilities for teaching, dissections, and clinics. The schools registered by these societies are 72, 19, 7, and 13 respectively.

In 1859 the Chicago Medical College, now the medical department of Northwestern University, was established to test the practicability of a thorough graded system of instruction. Students were divided into three classes, and each class was examined at the close of the year. Each of the three courses was six months in duration. Attendance on hospital clinical instruction and practical work in the chemical, anatomic and microscopic, or histologic laboratories were required for graduation. In 1871 the Harvard Medical School adopted a similar plan. The Syracuse Medical School followed, and to-day the graded system of consecutive lectures is the rule. In 1896 President Eliot wrote substantially as follows: Within 25 years the whole method of teaching medicine has been revolutionized throughout the United States. The old medical teaching was largely exposition; it gave information at long range about things and processes which were not within reach or sight at the moment. The main means of instruction were lectures, surgical exhibitions in large rooms appropriately called theatres, rude dissecting rooms with scanty supervision, and clinical visits in large groups. The lectures were repeated year after year with little change, and no graded course was laid down. There was little opportunity for laboratory work. The new medical education aims at imparting manual and ocular skill, and cultivating the mental powers of close attention through prolonged investigations at close quarters with the facts, and of just reasoning on the evidence. The subjects of instruction are arranged, as at the Harvard Medical School, in a carefully graded course, which carries the student forward in an orderly and logical way from year to year. Laboratory work in anatomy, medical chemistry, physiology, histology, embryology, pathology, and bacteriology demands a large part of the student's attention. In clinical teaching, also, the change is great. Formerly a large group of students accompanied a visiting physician on his rounds, and saw what they could under very disadvantageous conditions. Now instruction has become, in many clinical departments, absolutely individual, the instructor dealing with one student at a time, and personally showing him how to see, hear, and touch for himself in all sorts of difficult observation and manipulation. Much instruction is given to small groups of students, three or four at a time — no more than can actually see and touch for themselves.

In 1910 there were, excluding graduate schools, 135 medical schools in the United States with 21,394 students. The growth in medical students in 32 years has been 333 per cent. Of the 135 schools 112 are regular (19,983 students), 14 homœopathic (947 students), 7 eclectic (394 students), and 2 physimedical (70 students. Of the 154 medical schools, 129 held day sessions, 6 had evening sessions, and 5 did not report this item; 70 were departments of colleges or universities, 65 were separate institutions; all granted degrees.

More attention should be paid in the United States to instruction in hygiene and state medicine. In Great Britain no one can be appointed a medical officer unless he has a special diploma in public health. In this country little opportunity is afforded for general or special sanitary work on broad lines. This subject is now under discussion and doubtless progressive States will soon provide places where medical officers of health or other persons engaged in sanitary work can obtain practical and scientific training. The scientific investigations which would be made in the laboratories of such schools would be of great value to the public.

The earliest law relating exclusively to physicians was passed by Virginia in 1639, but like the later act of 1736 it was designed mainly to regulate their fees. The act of 1736 made concessions to physicians who held university degrees. In only two of the 13 colonies were well-considered laws enacted to define the qualifications of physicians. The general assembly of New York in 1760 decreed that no person should practise as physician or surgeon in the city of New York till examined in physic and surgery and admitted by one of his majesty's council, the judges of the supreme court, the king's attorney-general, and the mayor of the city of New York. Such candidates as were approved received certificates conferring the right to practise throughout the whole province, and a penalty of £5 was prescribed for all violations of this law. A similar act was passed by the general assembly of New Jersey in 1772. In 1840 laws had been enacted by the legislatures of nearly all the States to protect citizens from the impositions of quacks. Between 1840 and 1850, however, most of these laws were either repealed or not enforced as a result of the cry that restrictions against unlicensed practitioners were designed only to create a monopoly.

State Supervision.— Careful attention needs to be given to the difference between a license and a degree, the one carrying with it the right to assume a title which is evidence of scholastic ability, the other the right to enter on the practice of a profession or a pursuit, both emanating from the same authority, the state, either directly or through intervening mediums. As foreigners are often puzzled to account for the diversity in our legislation, the fact is again emphasized that all matters of internal police control are left exclusively to the several states, and that national laws regulating professional practice can not be enacted. Hence the laws of the United States will be silent concerning licenses and degrees except in so far as they may apply to the District of Columbia and certain recent political dependencies.

Licensing.— The requirements for admission to practise a profession in the 54 political divisions of the United States vary as greatly in the various professions as the political divisions differ in area, extent, population and importance. However, two general items appear in full or in part in the various statutory requirements for licensing; namely, (1) the general preliminary education requirements; (2) the professional preparation. The general preliminary are given uniformly under the synopsis of requirements.

Supervision.— In medicine all political divisions except Alaska now have examining and licensing boards. In some States the stringent laws against non-medical practitioners are enforced; in others quackery receives such legal protection that any person may treat "the sick or suffering by mental or spiritual means without the use of any drug or material remedy." This is due largely to the fact that so many statutes lack specific definitions as to what constitutes the practice of medicine, and without these definitions the conviction of such practitioners can not be secured through the courts. There is much misunderstanding in this country regarding the duty of the state in relation to the health of the people. It does not consist in discriminating between schools or systems of medicine, but in requiring without prejudice or partiality of all who seek a license to practise for gain on the lives of fellow beings a minimum preliminary and professional training.

Medical Sects.—As commonly understood, regular physicians have no distinctive theory or practice; homœopaths treat diseases with drugs that excite in healthy persons symptoms similar to the morbid condition treated; eclectics make use of what they regard as specific remedies, chiefly botanic; physiomedicalists use only botanical remedies, discarding those which are poisonous. In practice these distinctions are not always observed. The following political divisions have mixed examining boards, that is, the boards are composed of representatives of the several schools of medicine: Alabama, Arizona, California, Colorado, Hawaii, Idaho, Illinois, Indian Territory, Indiana, Iowa, Kansas, Kentucky, Maine, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Jersey, New Mexico, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Rhode Island, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, West Virginia, Wisconsin, Wyoming.

Philippines and Porto Rico have examining boards, the former of three appointed by the commissioner of public health, the latter of five appointed by the governor.

The following have separate examining boards for each recognized school of medicine: Arkansas, Connecticut, Delaware, District of Columbia, Florida, Georgia, Louisiana, Maryland, New Hampshire, New York, Pennsylvania, South Carolina, Texas, Vermont. Alaska has no examining board. Section 460 of “an act to define and punish crimes in the district of Alaska” amended June 1900 provides that physicians, itinerant, must first apply for and obtain license from a district court or a subdivision thereof and pay for the license $50 per annum.

Osteopathy.—“Discovered” in 1874, osteopathy (q.v.) is based on the theory that “a natural flow of blood is health” and that the bones may be “used as levers to relieve pressure on nerves, veins, and arteries.” Osteopathy is now recognized by law in Arkansas, California, Connecticut, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Montana, Nebraska, New Mexico, North Carolina, North and South Dakota, Ohio, Oklahoma, Tennessee, Vermont, Wisconsin. Practice of “the system, method, or science of osteopathy” is restricted to licensed physicians and to graduates of “a legally chartered and regularly conducted school of osteopathy.” The use of drugs and operations in “major or operative surgery” is not permitted in the practice of osteopathy.

Midwifery.—Special tests for certificates of registration as midwives are required in Connecticut, District of Columbia, Illinois, Indiana, Iowa, Louisiana, Minnesota, Mississippi, Missouri, New Jersey, Ohio, Philippines, Porto Rico, Texas, Utah, Wyoming. In the following political divisions the provisions of the medical practice acts do not apply to women engaged in the practice of midwifery: Alabama, Arkansas, Florida, Georgia, Idaho, Kentucky, Maine, Maryland, Michigan, Mississippi, Montana, New Mexico, North Carolina, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, Washington, West Virginia. In other political divisions, though there are some special provisions for certain localities, the general acts regulating the practice of medicine make no reference whatever to the practice of midwifery by women. It would seem, therefore, that these laws restrict the practice of midwifery to licensed physicians. Practically the conditions in political divisions where the laws seem to restrict the practice of midwifery to licensed physicians are little better than in political divisions where the practice of midwifery by women without a license is authorized by statute. There will probably be little change for the better till the midwife receives legal recognition, and the practice of midwifery is regulated by definite statutory provisions.

The following States have reciprocity clauses in the law, but they are operative in few cases only, namely: California, Connecticut, Delaware, District of Columbia, Indiana, Kansas, Maine, Maryland, Michigan, Nebraska, New Hampshire, New Jersey, New Mexico, New York, Ohio, Oregon, Pennsylvania, South Dakota, Texas, Vermont, Wisconsin.

Synopsis of Requirements, Jan. 1, 1904.—In the following political divisions medical diplomas do not now confer the right to practise medicine, an examination being required in all cases: Alabama, Arizona, Arkansas, California, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana (after 1 Jan. 1905), Indian Territory (Cherokee and Choctaw nations), Iowa, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Philippines, Porto Rico, Rhode Island, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin. The following require for admission to the licensing examination:

Alabama, requirements of State Medical Association.

Arizona, diploma from lawfully organized medical school.

California, diploma from legally chartered school requiring in no particular less than the Association of American Medical Colleges.

Connecticut, diploma from legally incorporated medical school.

Delaware, competent common school education, diploma from legally incorporated medical school.

District of Columbia, diploma of school authorized by law to confer M.D. degree.

Florida, diploma from recognized medical school.

Georgia, diploma from legally organized medical school.

Idaho, diploma from legally chartered medical school.

Illinois, four years of high school work, diploma from approved medical school.

Indiana, diploma from reputable medical school.

Indian Territory, Cherokee nation, diploma from reputable medical school; Choctaw, one term's attendance at reputable medical school.

Iowa, less than one year of high school work, diploma from recognized medical school.

Louisiana, fair primary education, diploma of recognized medical school.

Maine, diploma of reputable medical school maintaining an approved standard of preliminary education and medical instruction.

Maryland, common school education, diploma from legally incorporated medical school, as defined by A. M. C. A. or A. I. H.

Michigan, four year high school course or its equivalent, diploma from approved medical school.

Minnesota, four full courses of lectures at recognized medical school.

Montana, diploma from legally chartered medical school.

Nebraska, diploma from legally chartered medical school.

New Hampshire, full high school course or its equivalent, diploma from regularly organized medical school.

New Jersey, four year high school course or its equivalent, diploma from legally incorporated medical school.

New York, four year high school course or its equivalent, diploma from a registered medical school.

North Carolina, diploma from medical school in good standing.

North Dakota, three six month lecture courses.

Ohio, full high school course or its equivalent, diploma from legally chartered medical institution.

Oklahoma, diploma from a reputable medical school, or proof of ten years' practice.

Pennsylvania, common school education, diploma from legally chartered medical school.

Philippines, diploma from reputable school recognized by the Board of Health.

Porto Rico, diploma from an approved legally organized medical school.

South Dakota, diploma from a legally organized reputable medical school.

Utah, diploma from chartered medical school in good standing.

Vermont, high school course or equivalent and diploma from a United States medical school.

Virginia, evidence of a preliminary education, diploma from a chartered medical school.

Washington, diploma from authorized medical school having at least a three year graded course.

Wisconsin, elementary education equivalent to admission to junior year of accredited high school, diploma from reputable medical college.

The following require the licensing examination only: Arkansas, Hawaii, Massachusetts, Mississippi, Missouri, Oregon, Rhode Island, Tennessee, Texas, West Virginia.

The following require approval of medical diploma by duly qualified boards: Kentucky, New Mexico, South Dakota; diploma must evidence four full courses.

The following require either approval of medical diploma or examination by State or other duly qualified boards: Colorado, Indian Territory (Creek Nation), Kansas, Nevada, South Carolina, Wyoming.

The following, requiring either approval of medical diploma or examination, admit to examination on: Kansas, four periods of study of six months each; Nevada, five years practice in the State just prior to act or diploma from a reputable school without the United States; South Carolina (Regular board), diploma from any medical school.

Registration of Nurses.— Laws of New York 1903, chapter 293, in effect 27 April, amended the Public Health Law and provided for the registration of nurses. Under the act any resident of the State over the age of 21 years and of good moral character, holding a diploma from a training school for nurses connected with a hospital or sanitarium, giving a course of at least two years and registered by the University of the State of New York as maintaining in this and other respects proper standards, may receive a certificate of qualification to practise as a registered nurse and assume the title or use the abbreviation R.N. Nothing in the act confers authority to practise medicine. The Regents may on the recommendation of the Board of Nurse Examiners provided by the law, waive the examination of residents of the State 21 years old, of good moral character, of those holding a diploma from a training school or having three years' experience, and may admit on a practical examination in nursing those actually engaged in the practice of nursing when the law took effect. The waiver will expire by limitation in three years from the date of enactment. New Jersey, laws of 1903, provides for the license of trained nurses by a county clerk. Porto Rico, in the codified school law 1903, provides for the establishing of three schools for the training of nurses and places the jurisdiction of the same under the commissioner of education and president of the superior board of health. Virginia, law of 1 May 1903, is quite similar to the New York statute except that instead of R.N. the abbreviation of the New York statute for registered nurses, the abbreviations T.N. or G.N. may be assumed by trained nurses or graduate nurses duly licensed by the board. (See NURSE, TRAINED.)

Dentistry.— See DENTISTRY.

JAMES RUSSELL PARSONS, JR.,
Formerly of the University of the State of New York.

Medical Electricity. See THERAPEUTICS, ELECTRO.

Medical Jurisprudence, the science of applying medical knowledge to the purposes of legal investigation; the application of the principles and practice of various branches of medicine in judicial proceedings requiring the explanation of doubtful questions, such as those relating to conception and birth, time and cause of death, physical and mental diseases, etc. Medical jurisprudence is often spoken of as forensic medicine, that is, the medicine of the forum. It embraces subjects both purely medical and purely legal, and covers a very wide range. These questions have usually been considered under five divisions: (1) Such as arise out of the relation of sex, including impotency, pregnancy, legitimacy, and rape; (2) injuries to persons, as wounds, death from violence, poisoning, and abortion; (3) disqualification by different forms of mental diseases; (4) feigned disability or disease; (5) questions as to age, identity, and life insurance. The major part of what is known as medical jurisprudence relates to evidence given in courts, even if the whole subject is not properly embraced within the subject of judicial evidence. As medical books can be used only in a very restricted sense in judicial proceedings, the testimony of medical experts has become very important. Our laws do not give recognized preference to any particular class or school of medical practitioners as qualified for expert witnesses. Knowledge is the test of qualification to give such evidence. The presiding judge passes, as a preliminary, upon the question of qualification, and determines whether the witness shall be permitted to testify. The opinion of a medical expert is never conclusive but is simply to be regarded by the judge or jury in the same manner as other evidence given to assist in establishing a fact. The medical expert is frequently called upon to state facts, as well as to give his opinion based upon facts shown by other testimony to exist. He may testify as to the health of a patient whom he has treated, of his habits and mental traits. He may testify that he found poison in the stomach of a person found dead, and give an opinion as to whether the poison caused death. He may give an opinion as to how long a person has been dead, from the condition of the body when found; whether a certain wound would produce death; and his opinion as to the instrument used to inflict the wound.

In all of these subjects of investigation the evidence of a medical expert is almost indispensable. In matters of life insurance, where the insured dies shortly after a policy has been issued to him, medical expert examination and evidence are often of great importance, bearing upon the condition of the insured at the time of insurance, and upon the question of representations. In suits for injuries to persons through the fault of others the question of the extent and probable continuance of disability are to be investigated with the aid of expert evidence. Many questions of supposed crime could not be properly determined without the knowledge and skill of the physician, applied as science directs. In cases involving sanity and mental capacity medical jurisprudence reaches the zenith of its importance. The untrained non-scientific mind cannot measure the status and capacity of other minds. If it is difficult, sometimes nearly impossible, for the best informed to determine accurately the physical condition of a person, none but those eminent for knowledge of and experience in matters of the mind ought to judge of its condition and hazard opinions as to its peculiarities and capacity. Insanity is a disease of the mind which assumes many forms — almost as many as there are different phases in the human mind. Many definitions are given of insanity, one of which is that it is a physical disease located in the brain, which deranges the mental and moral faculties to a greater or less degree. This definition is not quoted in preference to any other for the purpose of approval, but because it differs so radically from others, and to show the difficulty of comprehending the nature of this dread malady. The general term insanity comprehends all shades of mental diseases, from the slightest abnormal condition to that of the wildest maniac. The expert alienist is called upon to testify as to a person's ability to make a will, a contract, or to transact any kind of business. He is asked to decide whether a person is bereft of his normal reason to the extent that prudence requires his confinement; and when he has been confined, whether it would be safe or prudent to let him have his liberty. The questions upon which the expert's opinion with regard to the insane, or those supposed to be insane, are asked can hardly be enumerated. The importance of the subject cannot be overestimated, and new and earnest efforts are being constantly exerted by the medical profession to render its information upon this difficult subject as full and complete as possible. Many works upon medical jurisprudence have been published, and in all of them insanity, in its various forms, has had a prominent place, while quite a number of authors have produced commendable works devoted entirely to the subject of the medical jurisprudence of insanity.

Medici, mĕd'ẹ-chē or mä'dē-chē, a Florentine family who rose to wealth through commerce, became prominent in the affairs of the state, gained supreme power, and were in general known as patrons of literature and art. GIOVANNI (1360–1429) rendered important service to Florence, and became gonfalonier in 1421. His son COSMO, the Elder (1389–1464), was called «Pater Patriæ,» gained vast wealth, was a munificent patron of art and letters, and combined statecraft with commercial enterprise. He was for 34 years the sole arbitrator of the republic and the adviser of the sovereign houses of Italy. His grandson, LORENZO THE MAGNIFICENT (1449–92) governed the state in conjunction with his brother GIULIANO (1453–78) till the latter was assassinated by the Pazzi, a rival Florentine family. Escaping from this massacre he conducted a war with Ferdinand of Naples, with whom he signed a definitive peace in 1480. The rest of Lorenzo's reign was passed in peace and in those acts of profuse liberality and magnificent patronage of arts and sciences, in which he rivaled or excelled his grandfather. He left three sons — PIERO (1471–1503), GIOVANNI (afterward Pope Leo X.), and GIULIANO, duke of Nemours. Piero succeeded his father, but was deprived of his estates when the French invaded Italy in 1494. He finished his career in the service of France. His eldest son Lorenzo came to power by the abdication of his uncle Giuliano, who became Duke of Urbino. He died in 1519, leaving a daughter, the famous Catherine de' Medici (q.v.), queen of France. After several reverses in the family, Alessandro, an illegitimate son of the last-named Lorenzo, was restored to Florence by the troops of Charles V., and by an imperial decree was declared head of the republic, and afterward Duke of Florence. The next name of importance in the family is that of COSMO «the Great» (1519–74), in 1537 proclaimed Duke of Florence and afterward Grand-duke of Tuscany. A learned man himself, he was a great patron of learning and art, a collector of paintings and antiquities. FRANCISCO MARIA I., his son, obtained from the Emperor Maximilian II., whose daughter Joanna he had married, the confirmation of his title of grand-duke in 1575, which continued in his family until it became extinct in 1737 on the death of Giovanni Gasto, who was succeeded by Francis, duke of Lorraine. MARIE DE MÉDICIS (q.v.) (1573–1642), queen of France, was daughter of Francisco I.

Medicine, History of. Within the past three centuries the average working life of English-speaking men has doubled. A few lived as long as now, and some strong or favored ones had efficient working powers as long; but the common life was worn out in what is now middle age. In Shakespeare's time the 50's were venerable: «Old John of Gaunt, time-honored Lancaster,» was 58 when supposably so addressed; and Admiral Coligny, murdered at 53, is described by his contemporary biographer as a very old man. Now, when we hear of a death in the 60's, we instinctively feel it an untimely cutting off, in what should be still fresh and vigorous age; and even at 80 it seems but just fair ripeness for the sickle. The three factors which have wrought this change are advanced physical comfort, medicine and its handmaid hygiene, and surgery. And in the mitigation of the frightful mass of actual pain, of physical torment which has racked every age down to the present, and which has scarcely even been alleviated till the past century, medicine stands incomparably first.

Some good foundations had been laid, it is true, in the century previous, and men were at work in the true scientific spirit. Great masters had stimulated their successors to study in the essential preliminary subjects, the constitution and functions of the body. The mighty Boerhaave of Holland (1668–1738) had revolutionized clinical observation; Morgagni of Italy (1682–1771) had «introduced anatomical thinking into medicine» (Virchow), and had done something the same service for pathology which Haller of Germany (1708–77) did a generation later for physiology; while John Hunter (1728–

93) had not only introduced capital improvements into operative surgery, but had set the pace in research into anatomical and physiological problems. But the influence of old theories, founded on guesses and imperfectly interpreted observation, still lay heavy on the body of practitioners. The chief general theories in the 18th century were those of William Cullen (1710–90) and his pupil and assistant John Brown (1736–88) of the University of Edinburgh: the former — a great advance on the older theory of «humors,» and on the right track — made the nervous system the seat of diseases; the latter divided all diseases into two classes,— the sthenic resulting from over-excitation and treated by depletion, and the asthenic resulting from under-excitation and treated by stimulation. On the Continent, Hahnemann (1755–1843), his great theory propounded at Leipsic (1796–1810) soon after took adverse ground in his «homœopathy,»— a very different thing from what later passed under the name, though the latter retained the underlying basis. Besides his «law of similars» which Hippocrates had formulated before him, he rejected theory utterly, declaring that it was impossible to know anything about pathological changes out of sight; that we can only know symptoms, and if those are removed it indicates of necessity that the disease which produced them must be gone also. He also alleged that the fact of a given dose causing certain symptoms in a healthy person was obvious proof that it must be too large for a sick one; further, that to possess healing power the dose must be too small for recognition by the senses or chemical analysis; and that trituration, or dilution and shaking, of minute doses caused molecular changes which infinitely increased their power — «dynamization,» he termed it. The exaggeration of symptomatics and empirics was a reaction against the current reliance on unbased theories; the paradox of infinitesimal doses, against the monstrous boluses and draughts with which patients were often gravely injured: there was usefulness in both reactions, but he went so far as to declare that a child could be cured while asleep by holding the pellets near it.

But the reign both of guesswork theorizing and of groping empirics, as exclusive methods, was coming to an end, and the first great blow was delivered in the first year of the century. France now came to the front where other countries had thronged. Bichat, a genius who wore himself out at 31 as did Clifford at 34, published the year before his death (1801) a work on general anatomy, in which he remade the entire science by showing that the different organs have membranes and tissues in common, and therefore that the seat of disease was in the constituent tissues and not in the organs as such. This not only simplified anatomy and physiology in much the same way that the alphabet simplified hieroglyphics, but threw the investigation of pathological changes into an entirely new channel. Parallel with this work, the followers in the footsteps of Morgagni were carrying on his work in studying morbid anatomy, the appearances of diseased organs; this too was remodeled on Bichat's discoveries. In 1808 and 1816 Broussais of Paris (1772–1838) published valuable works whose theory is merely the sthenic and asthenic idea of Brown, but which led to renewed research in pathological anatomy and local ailments. Percussion had been devised by Auenbrugger of Vienna (1772–1809) in 1761, and Corvisart of Paris (1755–1821) revived it; but a greater effect was created by the introduction of auscultation 1816–19 by the Breton Laennec (1781–1826) at Paris, where he was Corvisart's pupil. He invented the stethoscope to diagnose diseases of the lungs, heart, and abdominal organs, by means of alteration in the normal sounds of their action; and his own use of it, and observations on the diseases of these organs, were the greatest advance made in clinics since Boerhaave, and may be said to have founded modern clinical science. In 1827, Richard Bright at London (1789–1858) first published his recognition of the true nature of the kidney disease since called by his name, and of the general characteristics of renal complaints, the foundation of our knowledge of them.

A special branch of investigation and analysis in the first half of the century was in discriminating the continued fevers; one of the most active and anxious battle-grounds for practitioners and theorists since modern medicine took its rise; though eruptive and malarial fevers were well differentiated. The first to be discriminated was typhoid, by Louis of Paris (1787–1872). His American pupils, W. W. Gerhard (1809–72) and Alfred Stillé (1803), with C. W. Pennock (1799–1867), all of Philadelphia, and George B. Shattuck of Boston, proved that typhoid and typhus, theretofore loosely classed together, were independent diseases, though generated by similar causes. This was confirmed by the work of A. P. Stewart at Glasgow and Sir William Jenner at London. Dengue or break-bone fever, yellow and relapsing fevers, and their kind, were carefully studied. Among the other names associated with this labor are R. J. Graves (1797–1853) and William Stokes (1804–78) of Dublin, George Budd (1808–82) of London, and Daniel Drake (1785–1852), S. H. Dickson (1798–1872), and Austin Flint (1812–86) in America. This work was soundly based by 1860 in regard to fever clinics.

Development in the United States.— When the 19th century opened there were only three medical schools in the United States, and only two of importance,— those connected with Harvard College and the University of Pennsylvania, — and only two general hospitals. Medical education was somewhat on a footing with divinity education: physicians took apprentices for some years, and clergymen took private pupils in divinity. Those who wished and could afford a more systematic medical education went to London or Edinburgh. The literature of the profession was English and (translated) French almost wholly; Rush and a few others had published books, but not of moment, and there were only two or three medical journals. There were but two medical libraries except in private hands, those at the New York and the Pennsylvania Hospitals. The physicians of most reputation were Benjamin Rush and Philip S. Physick of Philadelphia, David Hosack and Samuel L. Mitchill of New York, and James Jackson and John C. Warren of Boston. The smaller places did not lack for able men, though of less widespread repute: such as Daniel Drake of Cincinnati, and Nathan Smith, founder of the medical schools both of Dartmouth and of Yale. But the great repute of the French medical investigators in the first quarter of the century — Bichat, Corvisart, Laennec, Louis, etc.— took an increasing number of American students there, and the new spirit they brought back revolutionized American practice for a time. The enormous increase in American population, however, enlarged the demand upon its stock of medical knowledge far faster than that could be legitimately developed: educated physicians could not be turned out so fast as the thronging populace needed them, and it was the golden age of the half-educated. Perhaps, too, the masses had the same ideas of the needlessness of training in medicine as in public life. The machinery was multiplied indefinitely, and the product turned out depreciated in proportion. Up to about 1870 the medical schools sprung up everywhere, both public and private, and their competition for pupils degraded the standard very low indeed. Diplomas were given for two years' work, and short sessions at that; and the instructors were sometimes as incapable of giving competent education as the authorities were unwilling to enforce severe study or careful experiment. The first place to exact a new and much higher standard was Harvard, about 1870. The rapidity with which the rest of the country, in the better institutions, followed its lead, showed that there was a large instructed upper class which appreciated the need of thorough education in this as in other departments of knowledge, and understood that medicine was a great science as well as a delicate craft. As always, the rich were glad to give when they knew where to give intelligently, and endowed generously both study laboratories and general and special hospitals. It would be a grateful task to enumerate these, did space permit: here can be mentioned only such names as Pierpont Morgan and Andrew Carnegie, Johns Hopkins and Vanderbilt, Sims, Strathcona, Mount-Stephen, Payne, and Lane.

Methods of Investigation.— The last century of course did not invent experiment in medicine or physiology: the method was recognized by the great Greek and Latin physicians, used by the two great Bacons, Roger and Francis, fully developed by Harvey, and utilized with superb skill by Hunter. But though these great men did not lack sound ideas, they lacked tools and the mass of laboratory facilities gradually built up in our age. The research laboratory is the development of the 19th century, and well along toward the middle of it. The workers in it experiment along three main lines,— the condition and functions of the organs in a state of health; the nature of the functional changes produced by disease, and the causes of the changes; and the prophylactic or curative agencies which can neutralize the disturbing agents. The results of these studies have created a new knowledge, which is to that of even 1800 like the relation of an adult to a baby. The physiological and pathological revelations have not merely left the knowledge accumulated in the previous centuries possessed of a merely archæological interest, but they have weaned us from the sway of any authority whatever; recognizing that even the seemingly soundest conclusions of the present are but working hypotheses, which may have to be abandoned at any time on fresh evidence,— the true scientific spirit. No part of life has been left as it was, the digestive and assimilative, circulatory, respiratory, and excretory, reproductive and directive functions have all been illuminated by a flood of light. Especially has this been wonderful in the study of the brain, whose functions not only are so intangible and elusive, but apparently so impossible of experimentation without destroying the subject of experiment. Not only have we penetrated deep into the secrets of the paths and operations of sensory and motor impulses, the localization of functions, and the mechanical implements of thought and memory, but we have been enabled to apply with great success a number of curative measures not before dreamed of, or even if so, not deemed possible of use.

Another marked feature of the age is the development of specialism, in which we have to set off a lack of co-ordination and breadth of knowledge or judgment against an extension of knowledge not possible by any other method. Scientifically, no other means has been so potent in extending and deepening the realm of demonstrated fact. Practically, no other has been so effective in developing curative processes. This specialism must not be confounded with that of the "lung doctors" and "fever doctors" of former days, mere guesswork empiricism of uneducated practitioners; it rests on a basis of competent general medical knowledge and thorough education in the specialty besides. The physicians who give their time and thought to one limited field — diseases of women, of children, of eyes and ears, of throat, of teeth, of the brain, or who, though less exclusively, choose diseases of the heart or the liver or other organs for their preferred field — have won for the profession some of its most signal triumphs. American physicians especially have stood at the very head of those who have perfected dentistry and ophthalmology, as well as gynæcology or diseases of women. In this branch the blessings they have conferred not only on women in ordinary disease, but on both them, their male relatives, and their children, by the saving of life and health, in the special crises of the sex, cannot be estimated.

One of the finest branches of this specializing is that of alienism: and the change in the mental attitude of the public toward it in consequence of that study has been most remarkable and gratifying. From a matter of derision, as it was largely in the Middle Ages, or ineffectual commiseration as an act of God, or mere terror and aversion, it has come to be sympathetically studied, often relieved, and always recognized as a mere functional disease. Starting from the labors of our own Rush, of the English Tuke, of the German Jacobi and Hasse, and the French Pinel and Esquirol, this reform has built up a body of physicians in every civilized country not only to study mental aberration scientifically, but to introduce humane and rational methods into its care and cure. America is not behind any other in the treatment of the insane; but the curse of so many good causes in America — politics — is a blight upon this science still in too many States.

Prophylactics.—«Prevention is better than cure» has reached its most brilliant exemplification in the 19th century. It is true that nations far back in antiquity have grasped some of the chief conditions under which diseases most prevail, and have even carried systems of public hygiene much farther than even yet we have re-attained to. The law of Moses furnishes a remarkable example, in its insistence on cleanliness, isolation, and diet; the Greeks systematized diet and exercise and general physical training thoroughly, their ideal being «the fair mind in the fair body» (and had discovered that professional athletes do not make good soldiers, from lack of endurance); the Romans and Greeks made the bath almost a fetish, far beyond even the English, and the public benefactor of the day gave his city baths, not libraries. But modern science goes much farther: it discerns the causes which create the disease itself, and removes or neutralizes them. In the 18th century some light had been thrown on this: Howard had seen that typhus was in direct ratio to the crowded condition of jails, Captain Cook and Sir Gilbert Blaine had perceived and removed the conditions that generate scurvy. Jenner had gone still farther and anticipated the methods of modern preventive medicine by vaccination. But all these could only be feeble and groping attempts until there was a scientific basis for them. This was furnished by bacteriology, and a few words upon that are needed to make later explanations intelligible.

The Bacteriological Basis of Preventive Medicine.— The ancients speculated with great eagerness and sometimes acuteness on the origin of life, and had guessed that disease and living germs were in some way related; and the relation of disease and putrefaction was not doubted. As soon as the first weak crude microscope was invented, it was used to investigate the organisms of decay. The Jesuit Kircher in 1671 examined the «minute worms» in putrid milk and cheese and meat; in 1675 a Dutch merchant named Leeuwenhoek improved his lenses and studied the «animalcula» in rainwater, saliva, intestinal fluids, and putrid substances; and the physicians of his day were quick to suspect and suggest that these organisms might be the cause of all diseases. In 1762 the Viennese Pleincz, who had studied fluids in all conditions, gave his firm adhesion to this belief. But this was not the whole; whence came these organisms — were they self-generated, or simply transmitted from other bodies and multiplied? Despite even the microscope, the theory of spontaneous generation maintained itself tenaciously far past the middle of the century. A distinguished chemist maintained as the result of careful experiment that germs were so generated, and even the proof that the organisms were forms already existent did not convince him or his followers. It was reserved for Pasteur in 1861, and finally (with Koch and Cohn) in 1876, to crush this theory forever. Following quickly on the first came the discovery of the anthrax germ by Pollender and Davaine in 1863; shortly afterward Lister's epoch-making researches into wound infection, making possible the triumphs of antiseptic surgery; then swiftly followed the isolation of the germs of relapsing fever, leprosy, and typhoid. But towering above all, from the enormous difficulties overcome, were Robert Koch's isolations of the tuberculosis germ in 1882, and of that of Asiatic cholera in 1884. Thence on, a crowd of discoveries of the germs of other diseases have left but few — unfortunately, some of the worst — unrevealed, diseases of animals and insects having been investigated as well as those of men.

Thus much for the history of discovery: but what are these germs? The popular mind is very confused on the subject. Bacteria are generally thought of as a sort of worm. In fact, they are not members of the animal but the vegetable kingdom; the smallest organisms known. They are protoplasm, a jelly-like substance, enclosed in a hard membrane exactly like wood fibre. They are classified by shape in three groups: cocci (spherical), bacilli (rod-like), and spirilla (corkscrew or undulatory shape). The cocci are found in pairs, fours, clusters, or chains; they include the smallest known organisms, some of them being as small as 1/150,000 of an inch in diameter. The bacilli are larger, but vary much: from 1/25,000 to 1/4,000 of an inch in length, and 1/125,000 to 1/16,000 in diameter; some of them have organs of locomotion, called *flagella*. The spirilla are longest of all, sometimes 1/600 of an inch. They all increase either by fission into two, or by developing a spore or seed. Their rate of multiplication does not seem rapid, but that is because we forget our old arithmetical «catches.» A bacterium dividing each hour, and each division thus dividing, would obviously have increased to 8,388,608 in 24 hours; and in three days to a number beyond all verbal expression, weighing nearly 7,500 tons. Of course this is a *reductio ad absurdum*, as the body they feed on would be exhausted early in the series; but outside of starvation, nature has other ways of arresting their multiplication.

Before discussing this point, let us look at the nature of bacteria as a whole. It is a misapprehension to think of them simply as a principle of disease and death. They are a universal principle of life as well, and the few species which cause harm are lost in the myriads which do good. But for them, organic existence would perish; it has been suggested that the first organic things on earth were bacteria,— organisms needing only nitrogen for support,— and life means their multiplication. They abound in air and water, in the soil to nine feet deep or so, and in the outsides and insides of all organisms; but naturally their number varies with the conditions for sustaining existence, and there are none at extreme altitudes or in glacier ice, and few in the polar regions or the deep seas. Those conditions are (1) moisture, without which all die; (2) air, as to which there are three classes,— aerobes which must have it, anaerobes which must not have it, and facultative anaerobes which care nothing either way; (3) food, which must be living tissues for a few, may be dead ones for most, and can be mineral salts or atmospheric nitrogen for some: (4) temperature, which has for possibilities of their multiplication, though not of their life, extremes of 32 and 170° F.; for an average most favorable tract 60 to 104°; and for disease germs (as evolution would imply) is most favorable

98.4°, or blood heat; (5) light, of which direct sunlight is death to all, and common daylight, of no importance either way to most.

Their enormous number gives them a power of accomplishment seemingly almost miraculous, and certainly far superhuman. The quality of farm products and dairy products, of fatted stock or wool, of hides or horn, and many other familiar articles, is due to them; and they are the scavengers of our water supply from pollution, as well as some of them deriving powers for harm from it. Still more to our surprise, peas and beans certainly, and all plants probably, gain their life from the soil through the medium of bacteria which live in their roots, decompose nitrogenous minerals and feed on atmospheric nitrogen also, turning both kinds over to the plant for its nourishment.

Hence the processes of health and disease alike are functions of bacteria. What medical science has specially to do is to trace the progress and manifestations of that spread of harmful bacteria commonly called «infection,» and the methods by which the system's natural tendency to starve or poison them can be reinforced. Before entering upon the phases of prevention and cure, we must indicate briefly how they obtain entrance, how they produce their effects, and what is the reaction of the body thereupon.

The first is naturally limited in variety: they enter by being injected from the bites of animals or insects, from wounds or abrasions, from inhaling infected air, from eating or drinking substances containing them. Specific cases will be considered later. The action of the microbes is by generating a set of poisons known as toxins, which produce either languor, loss of appetite, and vague general discomfort, or more active pains, headaches, fever, inflammations of the tissues, perhaps entire stupor. The action of the body is complex and difficult, and not thoroughly worked out; but some things are known. The normal blood and tissues have a germicidal power, varying in different bodies, even of full health, and varying still more as to specific germs, each body having its own set of germs to which it is congenial or maleficent. The struggle of the body against their multiplication, dependent on this unfavorableness of soil for their propagation, is called «general resistance,» and on its strength depends the immunity against ordinary disease; and the secret of inoculation is, that if the soil favorable to the propagation of a specific bacterium is eaten up, it is usually very slow in fresh growth. The disease microbe gains no lodgment because there is nothing to live on. But in addition to this passive resistance, an active one is carried on by the white cells or «leucocytes,»—the wandering cells, and those of the tissues chiefly invaded, as well as those of the spleen and lymphatic glands; these and others seem to work among the toxins and produce a change in their chemical constitution, at last elaborating counter-poisons or *antitoxins* which neutralize the first, and enable the cells to carry on the war against the disease microbes till one or other is overcome; and as said, if there is recovery, a partial or complete immunity is afforded against further ravages of the same class of microbe.

But it is evident that if this process can be shortened and made more certain, so that the antitoxins can perform their work before the disease microbes arrive at all, a great system of prophylactic or preventive medication can be had; and if the antitoxins are used in a case of similar disease, they will strengthen the natural power of the body to develop them, and greatly aid it in throwing off the disease. This is the new system of serum-therapy, begun by Pasteur in 1877, and continued by a set of brilliant experimenters since. The serum of the infected blood is chosen as a medium for injection into the blood of the patient. Pasteur with fowl cholera, Raynaud with cow-pox, Salmon and Smith in this country in 1886 with hog cholera, fully proved the possibility of the treatment, curing animals previously inoculated with the most virulent disease poisons, and rendering healthy animals immune; but these excited but languid interest till Behring's announcement in 1892 of a diphtheria antitoxin, with incontestable proof of its value. Oddly, not only laymen but physicians in many cases opposed it; partly from misunderstanding, partly from humanitarianism as involving experiments on animals. Most of its opponents have now been won over, from the crushing weight of evidence, and the brilliant work of its supporters. Diphtheria alone has reduced its mortality one half since the introduction of the serum treatment little more than a decade ago.

To illustrate the general methods of preparing all the serums for infectious diseases, that of diphtheria will serve as a model. The bacilli are cultivated for eight or ten days in alkaline beef broth, found to develop a peculiarly virulent poison under its work; the toxin is then isolated and its strength precisely estimated, then set aside in sterilized vessels. A healthy horse, found by experiment the most suitable animal, has injected under the skin of its neck or forequarters 20 cubic cm. of toxin and perhaps half that of antitoxin, three times five days apart; then it is given heavier and heavier doses of toxin alone, a week apart, till it can endure doses speedily fatal at the outset. After two months it is bled and its serum tested; if satisfactory, it is dosed as before for another month, when the maximum quality of serum is usually reached. The animal is then bled sufficiently, the blood being caught in a sterilized vessel and placed in a refrigerator. The coagulation finished, the serum is drawn off from the clot and its strength accurately determined in the laboratory, an antiseptic is added to keep it, and it is bottled for use. Antitoxins for tetanus and snake bite have been similarly prepared, and the present century will see probably every infectious disease and every venom with its bacterial antidote.

Specific Results of Preventive Treatment.— An abstract of the work already done in preventive medicine can best be given by a note of the great maladies of men and animals more or less controlled by it, with their bacteria. But it must be noted that of the ones cited, the bacteria of smallpox and hydrophobia (though the former has been almost exterminated by vaccination), as well as scarlet fever and measles, have not yet been isolated. The reason may be excessively small size, since that of cattle pleuro-pneumonia is barely visible under the microscope; or it may be that the organisms are not bacteria but unknown beings.

The diseases may be classified variously, and some admit no special classification, but we will begin with the great scourges which have desolated the world in the past, and which have owed their virulence and destructiveness, though not their direct origin, to filth and overcrowding and general unsanitary conditions.

(1) The Great Plague, or Bubonic Plague. The frightful devastations of this in the past need not be recited; it will be remembered that it was the «Black Death,» which swept off from a third to a half the population of Europe in the latter part of the 13th century. Long thought almost extinct, it reappeared with fearful intensity at Hong-Kong in 1894, spread to India and had several occasions of violent outbreak, raged in Turkey and on some parts of the Mediterranean coast, and in small volume has shown itself in Glasgow, South American ports, New York, and San Francisco. But in western Europe and America it has been easily put down, and serum inoculation has been fairly successful in India. Its bacillus is known to enter the body by wounds of the skin, and very largely by bites of fleas from infected rats.

(2) Asiatic Cholera. This terrible plague even in the middle of the 19th century swept away thousands of lives in America; now it has been so thoroughly controlled that it is not feared even to the extent of disturbing commerce when it appears. It originated on the banks of the Ganges in India, where Koch found its spirillum and the means of its spread,— almost entirely through drinking infected water, though very slightly by contact,— so little that since 1873 the disease in Great Britain and the United States has never got farther than the port of entry. How thoroughly a city's immunity depends on its water supply is strikingly shown by the twin city on the Elbe in 1892; Hamburg, using the unfiltered river water, had about 18,000 cases and 8,000 deaths; Altona, with a filtration plant, had 516 cases, largely refugees from Hamburg.

(3) Typhus Fever. It is hard to believe that this was once so steady and frightful a curse in the West that one investigator says its history would be that of Europe. In all the large cities, in camps and ships, hospitals and jails, it was almost permanent, and its rate of mortality appalling. It depended so entirely on filth and overcrowding that mere city sanitation and cessation of packing, sewers and a good water supply, have practically exterminated it except in a few slums. The rate has been reduced in England from 1,228 per 1,000,000 in 1838 (typhus and typhoid together, not then discriminated) to 137 typhoid and 3 typhus.

(4) Typhoid Fever. This disease, long identified with typhus, is now not only known to be separate, but dependent on somewhat different generating conditions. It depends not so much on dirt and crowding as on sewer gases and contaminated water and milk. Given pure water and perfect drainage, a city practically has no typhoid,— except when its milk supply is drawn from infected sources, as often happens; while seaside resorts are notorious generators of the disease, from the sand-driven wells and the crowded privies draining into them. The germ was discovered by Eberth in 1880, and called *bacillus typhosus*. The continued prevalence of the disease in our cities is due partly to the great hardiness of the bacillus, which can exist in the body of a patient long after recovery, and be a means of contamination. The outbreak in the Spanish-American war seemed due to overcrowding, but more likely to the contaminations caused by it, as in the seaside cases. In the country districts there is no mystery about it: often there is no rural sanitation, and even the wells are grossly neglected, sometimes on a slope below a barn. In the typical example at Plymouth, Pa. (about 8,000 people), the evacuations of a typhoid patient were thrown out during the winter on the banks of a stream which fed the town reservoir; the spring thaw carried them into it, and the town had a typhoid epidemic which struck down 1,200 people. The proper precautions are the use of boiled water, and of distilled-water ice, the thorough inspection of dairy surroundings and water sources, and great care on the part of physicians and nurses to disinfect discharges, are the true prophylactics.

(5) Diphtheria. This bacillus was discovered in 1883–4 by Klebs and Loeffler, and has been given their joint names; it enters either by inhalation or the stomach. The antitoxins thus made possible of preparation have reduced the mortality one half; the hygienic precautions have greatly reduced the primary prevalence. The latter are isolation and disinfection, watchfulness during convalescence, careful examination of the least throat disorder, and — since the mild and often unsuspected cases where the children go about and to school freely are the worst in spreading the disease, because not guarded against — regular inspection of school children's throats. Children's teeth and mouths should also be carefully attended to, and the tonsils removed where tonsilitis is frequent.

(6) Yellow Fever. The germ of this has not yet been isolated. Its dependence on dirt, however, would seem almost as close as typhus, thorough sanitation having practically eradicated it in its favorite tropic home, Havana, and in the Southern cities once ravaged by it. Jamaica has been almost freed from it in the same way.

(7) Smallpox. This once widespread and sometimes destructive scourge, almost more dreaded for life than for death, has been so nearly eradicated by vaccination, and vaccination alone, that the persistence of a strong section of the community opposed to it is one of the strangest of phenomena. The evidence is overwhelming. Wherever smallpox breaks out, it is in an unvaccinated district, country, or body of people, and the fatalities are almost all among the unvaccinated and never among the re-vaccinated; where two bodies of men lie side by side under the same conditions, as the French and German armies in 1871, the vaccinated body scarcely suffers, the unvaccinated one is decimated; and in Egypt, where the natives are compulsorily vaccinated and the foreigners escape it, the fatalities are five foreigners to three natives, though the latter are far poorer, worse housed and fed and medically cared for, and would naturally be supposed the chief victims. If all the people of a country were vaccinated, and re-vaccinated at fair intervals, the disease would absolutely disappear, as it has in the German army: it is the ones who escape vaccination that

maintain its existence. The ravages still among the unvaccinated French Canadians are a constant example of what it has been. For instance, on 1 April 1885 there was a smallpox death in the Montreal hospital, the Hôtel Dieu; the patients who had not had it were sent home; the disease spread like wildfire, and by the end of the year 3,164 persons died of it, the city's business for the winter was destroyed, and the loss was millions. It has been proved that not above one in 100 of the vaccinated takes the disease when exposed, and almost none die; of the unvaccinated, fully 99 per cent take it and 25 to 30 die. It must be remembered, however, that there cannot be perfect security without frequent re-vaccination, as the power of the cowpox varies with different persons and is rarely permanent, sometimes not over a year or two. With animal lymph there is no danger of the introduction of other diseases, the fear of which is made an excuse for refusal.

(8) Tuberculosis (including «consumption» of the lungs), called by Holmes the «white plague»; the most destructive single agency of death, and responsible for 120,000 deaths a year in the United States, more than all other infectious diseases together, except pneumonia. Formerly believed hereditary (the truth in a very slight degree), it is now known to be the product of a bacillus, isolated by Koch in 1880–2; and the hereditary conditions are mainly environment, with some tendency to anæmia. The communication, though in a few cases by infected milk, in the overwhelming mass proceeds by inhalation of the particles of dried sputum from other consumptives' lungs, blown about in the dust of streets or houses, or even wards of hospitals. Naturally, the greatest mortality is in places where free circulation of air is not possible, as jails and «institutions.» Nature seems to have provided for the largest possible distribution of them: one patient not in extremes has been known to give off from two to four thousand millions of germs in 24 hours; they are shaken from handkerchiefs, from the beard or mustache, from the furniture and other things handled by consumptives, beaten up from contaminated floors. So universally diffused are they that it seems probable there are few persons who have not some tuberculous lesion of some organ, for it is not confined to the lungs. The great weapons against it are, first, maintaining the standard of nutrition and cleanliness as high as possible; with careful protection of the chest; second, the education of the public in the dangers of the dried sputa; third, enforcement of notification and registration of cases; fourth, public sanatoriums for treatment of early cases; fifth, special hospitals for incurables. Immense progress has already been made: the rate in Massachusetts, one of the chief seats of the disease, has fallen from 42 to under 21 per 1,000 since 1853; and in New York, Glasgow, and other great cities the drop has been similar.

(9) Pneumonia. Frankel in 1886 isolated this germ, a coccus growing in pairs and chains and entering by inhalation; and with one fifth of healthy persons, present in the saliva. This is almost the one disease which has not diminished under medical and hygienic science, and has apparently increased, ranking next to consumption in deadliness. It is especially a disease of languid circulation, as in the aged (their typical disease) and invalid and the intemperate; but it lays low vast numbers of the strong as well. The treatment has been revolutionized from the bottom, but still from one fifth to one fourth of all attacks are fatal. Thus far the most valuable novelties have been measures to prevent sudden heart failure.

(10) Malaria. Till a generation ago, this was one of the obscurest diseases on our list; it still remains one of the worst drawbacks to civilization, preventing general Caucasian settlement in the tropics. It was known to have an intimate connection with wet ground, marshes or the building up and sewering of new districts; to prevail chiefly in the fall, and be caught chiefly from dusk to dawn; and to be noncontagious. But nothing more was known till M. Charles Laveran, a French surgeon who had gone to Algeria specially to study the disease, discovered the germs in the red blood-corpuscles of patients: not bacteria, but small protoplasmic bodies which begin as transparent rings inside the corpuscle, feed and enlarge on its coloring matter and form blackish grains from it, and on attaining a certain size divide and redivide in vast multitude, giving off a toxin which causes the acute spasm of fever, and apparently of chill also. Each variety of the fever is caused by a special form of the parasite. It was suggested by Dr. Patrick Manson of London that the communicating agent might be mosquitoes, also products of wet ground and active after dusk; and an army surgeon of India, Ross, found that mosquitoes did transmit similar parasites between birds,— developing them in their stomach cells into filary bodies, which pass into the saliva and so through bites into the bodies of others. It is now thoroughly established that this is the chief means of transmission among human beings. The mosquito is not the common *culex* of the northern United States, but chiefly the *anopheles*, which develops and transfers the parasites as just described. The crucial experiments are, that these mosquitoes, allowed to bite malarial patients, and subsequently healthy persons in non-malarious regions, infect the latter, and that in the deadly *campagna* around Rome, two persons during the worst season, from 1 June to 1 Sept. 1900, lived entirely immune by simply keeping behind tight netting after dusk, while exposing themselves freely during the daytime. The net result is, that swamps and stagnant pools should be drained, that persons having malaria should be thoroughly treated with quinine so that they may not transmit the disease if bitten by mosquitoes, and that Europeans can live in the worst districts by not being out after dusk and by thoroughly wiring their houses.

(11) Venereal Diseases. These are in one respect by far the worst of all we have to mention; for they are the only ones transmitted in full virulence to innocent children, to fill their lives with suffering, and which involve equally innocent wives in the misery and shame. In the victim, the infection does not stop with the parts originally affected; and it has not been seriously checked, from the nature of its causes making it impossible for society to stamp out or much diminish the actions which involve it. Physicians and the public have each solemn duties in this matter: the former, to act as apostles of continence, especially with the bache-

lors who pretend to believe that their health needs the indulgence and will not marry, and to use every effort to prevent the disease being carried to others; the latter to let no scruples of delicacy or affected ignorance stand in the way of thorough public supervision. The opposition to this is natural: women feel it adding an unfair stigma to an already shameful load of injustice; decent people feel that legal recognition is legal palliation and defense; and there is the real danger shown by experience, that if it is once shielded by the law, the weight of the police force will be thrown on the side of protecting instead of abating houses of ill-fame, as with liquor saloons but with far more disastrous results. But any risk is preferable to the present shocking conditions, which make city brothels a stream of contamination to what should be the purest of homes.

(12) Puerperal Fever. Remembering not merely the former fatality of this disease,—terribly frequent in private practice, and in maternity institutions rising from five even to ten per cent,—but the double bereavement it usually involves, the almost entire extermination of this disease is one of the grandest triumphs of modern medicine. Its contagiousness had long been suspected, when Oliver Wendell Holmes in 1843 published a full and clear statement of the facts leading to the belief; but for many years the profession generally scouted it,—a wit and poet could be no authority in medical science. Others gradually took his view; but it was the Lister antiseptic treatment which enabled it to be fully tested. Now the mortality is but about one third of one per cent.

(13) Hydrophobia. This disease, though widely distributed among animals, is not very common among human beings in America, but excites a widespread horror from the multitude of pets, any one of whom may chance to be stricken and to communicate it; in Europe it is less rare. The germ has not been isolated; but Pasteur ascertained its calculable effects on the nervous system, and that certain inoculations could render healthy animals immune and neutralize a powerful dose of the virus. He founded an institution in Paris for its treatment, and the mortality among those bitten by certainly rabid animals was reduced to less than one half of one per cent. In dogs, quarantine and muzzling are the only precautions.

(14) Leprosy. This is caused by a bacillus which probably enters the body through abrasions of the skin, and probably only from contact with another person; even so, it is but slightly contagious, contrary to the popular notion. It was discovered by Hansen in 1879, and since then an active and very hopeful investigation into prophylactic conditions has been carried on. Known to be old and widespread in Asia, it is not generally known that it came into San Francisco with the Chinese, that the Norwegians have given it a considerable foothold in the Northwest, and that in Louisiana there is an endemic condition of it, and slightly in some other Southern States. It exists in New Brunswick likewise. Still more important for the United States is its great abundance in Hawaii and the Philippines. It can be readily kept in check by segregation and inspection.

Some other bacilli may be mentioned, of which the discovery has not as yet been followed by large results in prevention. The deadliest known is that of lockjaw or tetanus, discovered by Nicolaier in 1884; it enters by wounds, and in some tropic parts all lesions tend to develop tetanus as surely as other sections do gangrene. Influenza, or "the grip," has one of the smallest bacilli known; it is spread by dried nasal discharges, and enters by the nasal tracts. Anthrax is a disease mainly of cattle and sheep. Its bacilli were the first micro-organisms of disease to be isolated, and can enter either by inhalation, infected food, or abrasions.

Changes in Therapeutic Method.—It is only re-stating the same fact to say that new practice has followed on new theory, or rather new scientific knowledge of the nature of diseases. The only object of acquiring the knowledge was to embody it in practice. With the discovery of the zymotic principle in disease, traced finally to bacterial action, there could not be the same or like treatment as when the body was supposed to be possessed by conflicting "humors"; or when a fever was supposed to be an abnormal increase of vital fluids needing to be drained off; or when diseases were supposed to have no relation to any function of the body except the organs furnishing the dominant symptoms; or when one school supposed them waves of some sort, to be overborne by more powerful waves of the same class, and another school refused to entertain any theoretical suppositions at all, but relied on the history of cases, printed or traditional or experimental. But it may be said that the greatest revolution in the century, or at any rate the last half of it, is in the position assigned to drugs. At the outset, the old faith in bleeding still held great sway: Boerhaave himself had made almost the whole art of medicine consist in its proper application, and at the end of the 18th century Washington had been sacrificed to it. But by the middle of the century it began to diminish. Both the homœopathic and the regular schools based their practice, and many still base it, on the study and administration of drugs. They differed in the size and strength of doses, from huge boluses, or powders or draughts whose efficacy was supposed to be in proportion to their nauseousness, to small bland triturations or dilutions; but not in the assumption that in them lay the one efficient method of dealing with disease.

The advanced school of the present does not discard medicines; so far from it, it studies them with more care than ever, and values a few, well tried and certain of quality and action, as highly as ever. It knows the mass of current medicines to be inert or worse, uncertain of action and applied to human functions of still more uncertain action; but it seeks to study thoroughly and apply scientifically the few real medicines or healing agents which must be used,—quinine and digitalis, and opium, iron and mercury and iodide of potassium, etc.,—instead of a swarm of dubious and varying materials. It is significant that some of the stand-bys are extremely old; iodine, as ashes of burnt sponge, was known in classic times, and ergot impressed its peculiar action on stock-raisers' minds from very early ages; even Peruvian bark is nothing new. We have not as yet made as many additions to the stock of panaceas as we might. But chemistry has done vast services for us, and will probably do far more. Aside from the discovery of new substances like cocaine, it has given us the active principles, of calculable strength and purity, in place of crude drugs of varying strength at best, and of varying purity and age; and there is no reason why we may not have new specifics as sure (and for as important diseases) as quinine.

But the new school does not feel itself under obligation to give any medicines whatever, while a generation ago not only could few physicians have held their practice unless they did, but few would have thought it safe or scientific. Of course there are still many cases where the patient or the patient's friends must be humored by administering medicine or alleged medicine where it is not really needed, and indeed often where the buoyancy of mind which is the real curative agent can only be created by making him wait hopefully for the expected action of medicine; and some physicians still cannot unlearn their old training. But the change is great. The modern treatment of disease relies very greatly on the old so-called «natural» methods, diet and exercise, bathing and massage,— in other words, giving the natural forces the fullest scope by easy and thorough nutrition, increased flow of blood, and removal of obstructions to the excretory systems or the circulation in the tissues. One notable example is typhoid fever. At the outset of the 19th century it was treated with «remedies» of the extremest violence,— bleeding and blistering, vomiting and purging, and the administration of antimony and mercury and plenty of other heroic remedies. Now the patient is bathed and nursed and carefully tended, but rarely given medicine. This is the result partly of the remarkable experiments of the Paris and Vienna schools into the action of drugs, which have shaken the stoutest faiths; and partly of the constant and reproachful object-lesson of homœopathy. No regular physician would ever admit that the homœopathic preparations, «infinitesimals,» could do any good as direct curative agents; and yet it was perfectly certain that homœopaths lost no more of their patients than others. There was but one conclusion to draw,— that most drugs had no effect whatever on the diseases for which they were administered.

These «natural methods» have been indicated above; but some further analysis of the individual elements is worth while. It will be noted that this is not, as a hasty reader might assume, the discarding of all the results of civilization and a return to barbarism. That the natural methods are efficient is precisely because scientific knowledge and modern improvements in appliances, as well as the thousand civilized devices for comfort and cleanliness, unattainable even a generation ago, have raised them to the level of first-rate therapeutic agents.

Perhaps foremost in the rank is the trained nurse, who is not only a greater agent of philanthropy than many professed altruists, but sets free the physician from a load of care and anxiety. In place of ignorant and stubborn, usually conceited and often superstitious women, who pride themselves on defying all the doctor's commands, these intelligent and loyal women can be relied on to carry out all his injunctions, to watch carefully for indications of danger, and to furnish notes enabling him to view the progress and hourly changes of a critical case.

The importance of diet in therapy, and indeed in the preservation of health before the system becomes a subject for the physician, has never been wholly lost sight of; but at no time has it been so thoroughly recognized, so firmly insisted on, raised to so high a place in therapeutic agencies. Too much food, improper or ill-prepared food, over-haste in eating, all have their part in the dyspepsia which is a byword among foreigners as the national malady, and though much lessened, is still most formidable. Over-eating, too, is largely responsible for the prevalent Bright's disease and degeneration of the arteries. Sweetmeats and the mixtures of the drug-stores, ice-cream soda and artificial flavors, are other potent causes; especially among girls is the eating of candies between meals. The business man's five-minute meal at the lunch counter saves his business time often to the permanent ruin of his health. The question of alcoholic drinks is usually left to the forum of morals or politics; but it has a serious bearing on health, though not nearly so much as one or two generations ago. The introduction of light beers has not only lessened drunkenness, but organic diseases of the liver, stomach, heart, and arteries.

Few influences on general health have been greater or more beneficial than the enormous multiplication of the means of cheap enjoyable outdoor exercise in America within the past generation. Owing to the climate, it is much harder to keep up habits of steady exercise here than in Europe, and unless there can be sociability with it, most people will not put themselves under the stress. We have not been a people addicted to sport or play, and formerly there were not sufficient means provided for us. Now tennis and golf, and the bicycle and their kind, are improving the constitutions, especially the nervous condition, of vast numbers. Of course there must be judgment in these matters, and probably some elderly people injure themselves by indulging in severe athletic sport only fit for young people with sounder tissues.

Massage need only be mentioned; its aim is primarily to remove obstructions to circulation. The normal blood should be sufficient to establish normal bacterial and other conditions, and massage gives it the freest play. The essence of bathing, called when practised scientifically «hydrotherapy,» is the same, save that its special function is to free the obstructed perspiratory system.

To these might be added a fourth, which in some sense is the most natural of all; for it has been practised in ages more remote by many thousands of years than the suspicion of either of the others, and by savages almost at the bottom of the human scale; that is, some form of suggestion or hypnosia. The main difficulty of this sort of treatment is that so little has been done to make it utilizable in practice, or to provide any certain means of assuring a definite result. Another is, that as with all the forms of mental science, its vagueness, its mystery, the impossibility of regulating its manifestations, surround it with so hopeless an atmosphere of fraud and of that open-mouthed credulity which irresistibly invites fraud. Yet after all, the psychical method has always played an important though largely unrecognized part in therapeutics. It is from faith, which buoys up the spirits, sets the blood flowing more freely and the nerves playing their parts without disturbance, that a large part of all cures arises. Despondency, or lack of faith, will often sink the stoutest constitution almost to death's door; faith will enable a bread pill or a spoonful of clear water to do almost miracles of healing, when the best medicines have been given over in despair. The basis of the entire profession of medicine is faith in the doctor and his drugs and his methods. This is no new discovery: it was said by Galen that “he works the most cures in whom most have faith”; and the doctor-chemist-charlatan, Paracelsus, who died of taking a universal panacea too poisonous even for his confidence, told his patients to have full faith and a strong imagination, and they would see the effects of it.

The subject of hypnotism, originally called mesmerism from its 18th century describer and practiser, can only be touched upon. Different practitioners have had such varying results from its use as to suggest that here too the personal equation is very important. Braid of Manchester, England, who first made a scientific study and attempt at utilizing it, was not successful; while an English surgeon in India, Esdaile, was highly successful, performing 268 operations on patients with all the effect of anæsthetics, not then introduced. Its possibilities have been greatly exaggerated, not so much by the claims of the persons using it (except impostors) as by the eager credulity of the public. It seems not so much to create a new condition of sensitiveness to suggestion, as to increase what normally exists. In organic disease it is practically useless. Its great service has been found to be in various affections which may all be classed as of the nervous system: hysteria, spasmodic functional complaints, children's vicious habits, and the victims of the drug and alcohol habits; occasionaly in childbirth and surgery, but it is precarious and not free from serious dangers. It should no more be practised without witnesses present than dentists give nitrous oxide; and the law should restrict its practice to special licensees or physicians of a certain grade. WILLIAM OSLER, M.D.,

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Medicine, Recent Progress in. Of none of the departments of human knowledge can it be said that it is thoroughly and positively progressive more than of the science of medicine. The new birth of medicine may be said to be associated with the names of three men, Virchow, Pasteur, and Lister (qq.v.), all of them men of the 19th century.

Virchow, while not the discoverer of the different cells of the body, determined that its tissues were entirely composed of cells of various kinds, and he particularly identified the different types of diseased structure of the tissues by the form of cell which predominated in each of them. Pasteur opened to the vision of the world the vast field of the infinitely small, discovered and described many varieties of bacteria, separated them from one another, cultivated them on artificial media, and demonstrated their enormous significance for good or evil. As the father of the science of bacteriology (q.v.) he was one of the greatest benefactors the world has ever had. Lister, who but lately has left us, full of years and of honors, may justly be called the apostle of cleanliness. To him more than to anybody else is due the demonstration that cleanliness is really next to godliness. By avoiding dirt of all kinds, by the use of chemicals to destroy germ life, and finally by the simple practice of absolute cleanliness in every department of surgery he revolutionized that art, and made possible, as matters of every-day occurrence and of comparative safety, procedures which before his time were considered extra hazardous, and which in the great majority of cases resulted fatally.

So it may be said that modern medicine is built mainly upon the work of these three great men.

It will be impossible of course in a brief article like the present one to do more than touch upon a few of the points which may be said to be representative of the recent progress in medicine.

The stimulus produced by investigations of Lister in the realm of antisepsis during the seventh decade of the last century was quickly responded to by surgery. The chief points in Lister's recommendations consisted in cleanliness of wounds and all their surroundings; cleanliness of the surgeon, especially of his hands and finger-nails; the use of carbolic acid, particularly in the form of spray in the operating room during an operation, to destroy the disease germs in the atmosphere, and the use of antiseptic dressings or coverings upon wounds.

The older surgeons smiled at all these details which seemed to them foolish and unnecessary. After 25 years practically all opposition had been overcome. The results compared with the results under the old system simply compelled the adoption of the new principles. But experience also showed that the use of powerful chemicals was unnecessary in the treatment of wounds, and that often it was really injurious. It was then determined that the sterilization of every thing which had any relation to a wound could be accomplished quite as effectually through heat and moisture as with chemicals, and with a greater degree of comfort and safety. Consequently the instruments, the dressings and all the apparatus connected with an operation were subjected to a high temperature sufficiently long to destroy all germ life, and the surgeon himself, and all his assistants, put on freshly laundered white clothing, and washed and scrubbed their hands, face, and arms with soap and water sufficiently long to ensure relatively complete cleanliness. Then rubber gloves were put on as an additional safeguard against the contamination of the wound which was about to be made.

This is practically the procedure which is now carried out at a surgical operation in every modern hospital throughout the world. Such precautions enable surgeons to penetrate any portion of the body with absolute fearlessness, and with the confidence that in the great majority of cases in which proper judgment has been shown in selecting the case, and proper skill possessed by the surgeon, the patient will recover. It will not bring the dead to life, but it will often restore those whose lives hang by a mere thread. Thus surgeons are able to perform operations within the skull, within the cavity of the chest, within the cavity of the abdomen, and within the joints, and upon the brain, the heart and lungs, the stomach, liver, spleen, intestines, pancreas, ovaries and uterus, and the kidneys, ureters and bladder, which were impossible before the time of Lister, or if they were performed the patients almost invariably died.

One of the most recent developments in surgery consists in the transfer of blood from the arm of a healthy person directly into the circulation of one who is almost at death's door either from loss of blood or from the shock of a surgical operation, or from some other cause. An attachment is made between an artery in the arm of the healthy person and a vein in the arm of the sick person, by means of a suitable tube which is carefully adjusted into openings made in the vessels above mentioned of the two persons, the outflow being so gauged that it will be known when the proper quantity has been withdrawn. The method has proved lifesaving in a number of instances, but it is not without danger, for should a clot or clots form in the outflowing blood it would quickly check the circulation in the receiving person or might quickly cause death by interference with the heart action.

Another important procedure which has been perfected during the past 25 years is what is known as the Cæsarean section, which consists in removing a child from the womb of its mother through incisions in the abdominal wall and the womb. This is a very ancient operation and is attempted when it is believed that the child cannot be born by the ordinary channel. The result was formerly fatal in the great majority of cases to the mother if not to the child. Under the modern methods of surgical procedure it is now done with great frequency, sometimes even by doctors of inferior surgical skill and experience, and in most of the cases both the mother and the child recover.

Under the influence of the reforms instituted by Lister the practice of obstetrics is far safer, both for the mother and for the child than ever before.

Fifty years ago a maternity hospital was little better than a graveyard. If a mother survived the immediate danger of parturition she was very likely to die from the bloodpoisoning or septicæmia which followed. Now, thanks to the influence of Semmelweiss, Holmes, Lister, and those who have followed them, a maternity hospital is the safest place in the world for a woman to give birth to her child, not alone because the doctors in such hospitals have more skill than formerly, but because they are clean themselves, and everything around them is clean.

In the treatment of disease great advances have been made. There are many more drugs upon the market than formerly, and doctors seldom write out a surgical prescription nowadays. The medicine makers have forced their wares upon the profession, and for every disease it would seem as if there were an hundred remedies. Some of these remedies are valuable, but the greater number are valuable chiefly in the eyes of those who make and sell them, and who can induce the public to use them and have faith in them.

But there is one marvelous remedy which has been brought forward within the past few years which is known as "Salvarsan," or popularly as "606" because its discoverer, Professo Ehrlich, made 606 chemical combinations before he hit upon this one. (This number has since been increased to 914, the new compound being called "Neosalvarsan.") This substance is a compound of arsenic and is used in the treatment of syphilis, which is one of the most deadly diseases, in the wide extent of its ramifications, of all the diseases of which human beings are victims. A single injection of this substance into the tissues will sometimes cure a case of many years' duration. But it is not infallible, it sometimes is followed by bad results, it must sometimes be used during a considerable period of time and its best effects are sometimes obtained when it is combined with a suitable preparation of mercury, which heretofore has been the mainstay in the treatment of syphilis.

Investigations have been constantly proceeding to endeavor to find a cure for that greatest scourge of the human race, cancer. Many so-called remedies have been discovered, and announced, only to be quickly abandoned. As cancer is known to be a local disease in its incipiency, it is often cured by the surgeon's knife when attacked sufficiently early, and with sufficient thoroughness.

The recent studies of Wassermann and Ehrlich in the endeavor to find a substance, synthetically composed, which shall have a selective action for the cells of cancerous tissues, and be inactive upon other tissues, seems to have been successful in cancer in mice, which form one of the few species of animals, if not the only one, in which the disease may be transmitted from human beings. If the result should prove what there is great reason to believe it will prove, it would be one of the greatest victories in all the annals of medicine.

Tuberculosis is yielding to the steady attacks which are being made upon it in city and country. It has long been known that it was curable, all that it has needed has been a concerted attack upon it; and now by means of a few drugs, a proper diet, plenty of pure air and an out-of-door life, the conquest of this terrible enemy is almost in sight. Sanitariums and open air institutions of treatment, public and private, for men, women, and children are being established in all suitable parts of the country, and the number who are being radically cured of the disease is increasing enormously every year. What is really better is the intelligent perception and comprehension of the disease which will prevent people from contracting it, and in course of time we may expect it will occur with comparative infrequency.

One of the great discoveries of the past 20 years was what is known as the X or Röntgen rays. Their power of making invisible things visible is well known, and their application to the photography of the interior of the body has been of priceless value. They have also been used in the treatment of certain diseases, sometimes with alleged success, but often with positive harm. Their influence in producing severe burns, which it is almost impossible to cure, is well known. In not a few cases their use has led to the development of cancer in those who worked with them.

Quite a number of physicians have lost their lives as the result of malignant disease produced by their influence. The influence of serums, vaccines, and cultures of bacteria, and their products, in the treatment of disease is a subject which is now absorbing a vast amount of attention both in the laboratory and in the treatment at the bedside. It would seem as if we were at the threshold of an entirely new order of things in this respect. Fever which has long been considered baneful, is now regarded as frequently beneficial.

The bacteria which are constantly in the body are found to be harmful, or beneficial, or indifferent according to the conditions of the body. Harmful bacteria when killed and injected into the body, may sometimes cure diseases which at other times they would cause. The constituent elements of the blood are ingredients in a great reservoir, some good and some bad, and good or bad according to certain conditions.

The subject is an exceedingly complex one, and is not yet throughly worked out. Sir Almroth Wright who is one of the chief exponents of the system makes the extravagant claim that it will be the only method of treating disease in the near furture. Metchinkoff, the pupil of Pasteur, great like his master, has strongly advocated the use of milk fermented by the lacticacid bacillus as one of the chief means of inducing extreme longevity, and incidentally of promoting good health. The vast number of people, particularly in Asia, who live and thrive mainly upon milk, which has been fermented by some means or other, furnish a strong argument in favor of Metchinkoff's contention. Certainly a resort to so simple a diet as this will prove advantageous to multitudes of Americans who are overfed, or who are fed upon food which is entirely unsuitable for them.

The statements which have been made in the last few paragraphs will indicate the trend of thought at the present time, which is largely in the direction of preventive medicine (q.v.). Prevention is of course better than cure, and the great object now seems to be, to find substances which will make one immune or proof against the attacks of various forms of disease. In pursuance of this doctrine inoculations with properly prepared germs or their products are now made for smallpox, diphtheria, typhoid-fever, lock-jaw, pneumonia, and various other diseases. It is a field which is full of promise and of hope.

This article should not be concluded without a word in regard to the great triumphs which have been achieved by the development of sanitary measures. It is known that certain diseases are propagated by insects. Malaria is propagated by a particulr species of mosquito and the same is true of yellow fever. It is known that the mosquito breeds in stagnant water. The elimination of these diseases from the places where they abound would seem therefore to be dependent upon the elimination of the mosquito. This has been tried on a grand scale in the building of the Panama Canal (q.v.) and in the cleaning up of the city of Havana. The drainage and sanitation of the canal zone are the work of an army doctor, Colonel Gorgas. Without this work the canal could not have been built. By doing this work the canal zone has been transformed into an agreeable health resort.

The great thing in connection with disease as a feature of human experience seems to be to discover its cause and when this is clearly determined a resolute will, with patience and intelligence will usually find the means for removing the cause.

The recent history of medicine has also been marked by the establishment of sanatoria for the treatment of particular forms of disease, and of various institutions and laboratories for special investigation and research. Fifty years ago none of these were in existence. The plan of these institutions is to study exhaustively a single disease, or group of diseases, experimenting patiently and continuously upon human beings and animals by means of chemical and biological procedures, by mechanical measures and by means of every other form of assistance which human ingenuity can devise.

This work is prosecuted unceasingly until the cause of the disease is ascertained, and when that point has been reached the study is continued for the removal of the cause, or for its effective overcoming. In other words, a life and death struggle is going on between the forces of disease and the intelligence of man as never before, and one after another of the strongholds of disease is being battered down.

Not only in this country but in all the countries of the civilized world has this spirit of inquiry into the cause and treatment of disease infected men as with a consuming fire.

One of the best illustrations of progress in medicine from an institutional point of view is seen in the development of our boards of health and sanitary organizations, municipal, state, and national. In many of our cities, especially in those of the first class, they are very highly organized.

Besides the usual care for infectious diseases they have the responsibility for the purity and healthfulness of the water supply, for the quality of the milk supply, including the condition of the dairies from which it is derived, or the quality of the food supply in general, for the ventilation and safety of public buildings, for the sanitary condition of tenement houses, for the inspection of school children and the general supervision of their health, and for a great many other functions which have a bearing upon the public sanitary condition.

One of the most important departments of their work concerns their laboratories where evidences of suspected disease are investigated, diagnoses of physicians confirmed or negatived, inoculation material prepared for the treatment of infectious disease among the poor and a great deal of very useful additional work done of which the public at large knows little or nothing.

Hospitals for certain diseases, especially those which are highly infectious, like diphtheria and scarlet fever are also under their care in some of the cities, and are means for obtaining valuable data concerning the history of such diseases. Of the sanatoria, public and private, which have been established in recent years for the care and investigation of disease, those which are of a public or semi-public character are, as a rule, the ones which have accomplished most in throwing light upon the problems which relate to disease.

There is no disease into the study of which more enthusiasm has been thrown in recent years than that of tuberculosis and many sanatoria have been established in various parts of the country for the care of the tuberculous.

One of the most important aspects in the treatment of this disease consists in the care of the children of tuberculous parents. It has led to the organization of open-air homes for their treatment. One of the most useful of this class of institutions is the Preventorium, as it is called, which has an estate of 170 acres at Farmingdale, N. J., with suitable buildings and equipment. It takes selected children of tuberculous parents, debilitated and susceptible to disease, between the ages of 4 and 14, to a comfortable place where they will have plenty of wholesome food, 12 hours of rest in bed at night, and an additional hour after the midday meal. It gives them two and a half hours of school instruction, and requires a few trifling household duties. The remaining eight and a half hours are devoted to play in the woods and fields.

The institutions of investigation and research may be devoted to the study of a single disease, like cancer with its wide ramifications, an illustration of which is the laboratory for the study of cancer at Buffalo, N. Y., or they may take up a single disease, study it until all possible information has been gained, and then take up another disease and treat it in a similar manner.

This is the method of the Rockefeller Institute (q.v.) in New York.

A short time ago a study of infantile spinal paralysis was made at this institution. All the members of the staff, from the director down were supposed to be studying that disease from every possible point of view. When the work was finished the director published his report and it included everything which could be found out about that disease, which was worth knowing, up to that time.

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Medicine, American Academy of. See AMERICAN ACADEMY OF MEDICINE.

Medicine Dance, a common practice among the American Indians; dances being conducted by the medicine men of the tribe for various purposes, and in preparation for different events, like warfare, the hunt, etc. Both in the dance before a battle and in the conflict itself the medicine chief is the one man most worthy of consideration. If war takes place he courts the thick of the fight if for no other reason than to show his immunity from danger. The funeral dance of the Yaqui tribe is a representative example of the medicine dance; the chief medicine man arranging the ceremony, which ensures the safe passage of the dead to the spirit world The dancers to the number of half a hundred appear in the centre of the assembled tribal gathering, naked except for a cloth about the loins. Their bodies are painted in imitation of skeletons. Over their heads they wear masks fringed with long horse-hair, dyed in many hues, eyelashes and eyebrows hang over the rudely designed faces, and beards reach nearly to the waist. On their legs they fasten strings of rattles cut from rattlesnakes, and the sound of these is most grewsome to the spectators. Each dancer carries two knives, one in each hand, with which he gesticulates violently in imitation of the act of slaying imaginary enemies. Every man dances after his own ideas, each seeming to outdo the other in the violence of the motion. Music for the dance is furnished by tom-toms. After the dance a great feast follows, continuing until midnight.

Medicine, Eclectic, embodies the principles and practice of the only established American school of medicine. The term Eclectic was not the most fortunate, for at no time has it adequately defined the school's position. When chosen, the term was very popular and was borne by several education systems and books, and was moreover, well known to the laity. The name American School of Medicine, as proposed by Dr. A. H. Baldridge, one of its pioneers, would have been more expressive, would have avoided misunderstandings and would have saved the school much criticism regarding its position among the existing systems of medicine. Eclecticism is the direct successor of the American Reformed System of Medicine originated by Dr. Wooster Beach of New York city in 1825. It should not be confounded with Thomsonism (Thomsonianism), or the doctrines of the steam and herb doctors, promulgated and practised in the early part of the 19th century by Samuel Thomson of New Hampshire, the peculiar theories of which the Eclectic school never adopted; the majority of the followers of Thomson being among their most bitter antagonists. In later years, however, many of the Thomsonians joined the Eclectic school and creditably assisted in up building it. The most successful organizer of the Eclectic school was Dr. Thomas Vaughan Morrow of Kentucky. The investigations in medical botany and materia medica by Schoepf, Benjamin Smith Barton, W. C. P. Barton, Constantine Rafinesque, William Tully and others gave an impetus to the movement which resulted in the establishment of the new school. The Reformed School of Medicine, by which name, what was later denominated Eclecticism was first known, was organized in opposition to the drastic practice of the dominant school of medicine,— bleeding, blistering, and the abuse of the salts of mercury and antimony,— against which Eclectics, as well as the followers of Thomson and Hahnemann, protested. Instead of these barbarous remedies the reformer sought to substitute milder measures and to employ vegetable medicines whenever possible. Yet, in the light of the present the substituted practice of the early reformers would be regarded as but little less barbaric than that which they sought to supplant. The basis of Eclectic philosophy was the sustenance of the vital forces, the avoidance of depleting remedies, and the selection, as with the ancient Eclectics, of the best of remedies and means from all sources, even despising not the primitive medicines of the untutored American Indians. They did not rest contented, however, with merely "selecting the best"; they endeavored to improve on such selections. To the reformer the practice of the dominant school was cruel and inhuman, the remedies barbaric. Out of the common stock of remedies he chose those best suited to his purpose in what he believed to be a more humane practice. He looked forward to certain ideals and objects not in accord with the views and practice of the dominant school. For his presumption in thus opposing the authorities in medicine and by inaugurating unwelcome innovations he was branded an irregular; was ostracised by the self styled regular physicians. An outcast, he was thus forced to organize a school in accord with his theories and practice.

There are three epochs in the history of Eclectic medicine,— the period of reformed medicine, from 1825 to 1845; the formative period, from 1845 to 1869, which was largely concerned in organization, and study of plant remedies; and the period of specific medication, from 1869 to the present, in which the best work of the school has been accomplished, and during which the theory of specific medication was promulgated and has been most largely practiced.

The educational history of Eclecticism dates from 1825, when Dr. Beach privately instructed students at his clinic in New York, where, in 1827, he established an Infirmary, which in 1829, he expanded into the Reformed Medical Academy. In 1830 it assumed the more dignified title of the Reformed Medical College of the City of New York. It was well equipped and continued in operation until about 1838. Text books of a high order were prepared by Dr. Beach. A national society was formed and from this body an expansion movement was begun by the selection, in 1830, of Dr. John J. Steele as an agent to proceed westward and explore the towns on the Ohio River with a view to selecting an eligible site for a branch of the New York College. A circular of the society having reached Worthington, Ohio, Col. James Kilbourne, president of Worthington College, invited the promoters to establish their school in that town. Dr. Steele accepted and Drs. Thomas Vaughan Morrow and Ichabod Gibson Jones were sent to perfect the organization. The Reformed Medical Department of Worthington College, as this school was called, entered upon a successful career in 1830, with Dr. Morrow as the leading spirit, but lack of proper facilities, the machinations of enemies, internal dissensions, and the financial crisis of 1837 caused it to be suspended in 1842. Dr. Morrow next removed to Cincinnati, Ohio, and assisted by Drs. Lorenzo Elbridge Jones and Alexander Holmes Baldridge, at once organized the Reformed Medical School of Cincinnati. In 1845 this college was chartered by the State of Ohio as the Eclectic Medical Institute. From this time the term *Eclectic* has been employed to designate the system and its physicians.

The formative period of Eclecticism began with the chartering of the Eclectic Medical Institute in 1845 and ended with the introduction of specific medication in 1869. During this period large classes attended the Institute. 'The Western Medical Reformer,' begun in Worthington in 1836 and suspended in 1838, was now revived and published as the 'Eclectic Medical Journal.' Barring a brief half year suspension this periodical has continued to be published to the present time. In this period, Dr. John King, justly styled the father of modern materia medica, began the publication of his numerous text books, among which the 'American Dispensatory' gave the school an enduring and monumental work on materia medica. The pharmacy of the school advanced from crude drugs in powder, infusion, and decoction past the resinoid and alkaloid distraction to improved galenicals. In this connection be it recorded that Professor King discovered and introduced the resins of podophyllum and macrotys, which together with the alkaloids of hydrastis and sanguinaria, were afterwards prepared by Dr. William Stanley Merrell. These valuable agents together with the oleoresins of iris and capsicum attracted the attention of pharmacists. A host of indefinite compounds was added by others and the market was flooded with what purported to be Eclectic resinoids or concentrations. This heterogenous class of pharmacals was denounced by Professor King and others who had sought to introduce only elegant and definite compounds. This much abused class of resinoids, served, however, a temporarily useful purpose in the evolution of a more perfect materia medica. Of these preparations, only those made after the methods of Dr. King, and the alkaloids of hydrastis and sanguinaria have survived and singularly are now mostly employed by practitioners of the dominant school. During this period Eclectic colleges were established at Rochester and Syracuse, Louisville, Philadelphia, New York, and Cincinnati. The majority of these were short lived and some of them had a strong leaning toward the system of botanic medicine now represented by the physio-medicalist. The Eclectic Medical College of Pennsylvania for many years in good repute, finally drifted away and during the later years (since 1871) was neither recognized by Eclecticism nor others. In 1856, a portion of the faculty of the Eclectic Medical Institute formed a rival college in Cincinnati which had a large following. This school was absorbed by the Institute in 1859. The Civil War seriously threatened the educational progress of the cause and the withdrawal of a large quota of Southern students caused a marked shrinkage in the attendance at the Northern schools. Times were hard and the outlook gloomy. Dr. John Milton Scudder, a graduate of the Eclectic Medical Institute in 1856, now became the head of that institution. By strict business management he inaugurated a period of renaissance and Eclecticism soon became a recognized force in medicine in America. Specific medication, introduced by Dr. John M. Scudder in 1869, though at first vigorously opposed, is at present the basis of practice of fully three-fourths of the Eclectic physicians and is the leading therapeutic doctrine taught in all the Eclectic colleges. In fact modern Eclecticism is the practice of specific medication. Its theory is as follows:— Disease is a wrong or impairment of life. It is manifested clinically by certain well defined symptoms. The totality of symptoms express a condition, to which, in the usual nosological classification, a special name is given. This disease name is of value only in the study of the natural history of diseases, for statistical data, for the purpose of recognizing contagious and infectious diseases, and for establishing a prognosis, certain necessarily fatal diseases allowing only of palliative treatment. The specific medicationist, like practitioners of other schools, pursues such a method of nosological diagnosis for the purposes named, but not as a guide to treatment, in which to him it is of little or no value. For therapeutic purposes he reverses this process and studies his case by analysis, not by synthesis, to discover if possible, the varying conditions which make up the disease, as evidenced by specific and well defined symptoms revealing disease expressions. Remedies have a certain force, and are definite in action. Like effects follow like causes. Hence, having found, by repeated experimentation, the opposing action of a drug in a certain condition of disease, as expressed by certain specific symptoms, objective or subjective, the same remedy will always relieve or cure like abnormal conditions. The believer in specific medication holds that there is a fixed relationship between drug force and disease expression.

The Eclectic has no specifics for *diseases* but specific remedies for specific conditions of such diseases. Specific diagnosis implies diagnosis to discover the condition curable by a certain remedy, as established by previous experimentation, and specific medication means the application of the known remedy for the pathological condition so found. Specific diagnosis is therapeutic, not nosological diagnosis. In practice the specific medicationist is guided in the selection of his remedy by «specific indications,» as illustrated by the few following examples: The strong, excited, bounding pulse indicates veratrum viride; sharp, cutting or lancinating pain in serous tissues, bryonia; the full, oppressed pulse with a sensation of præcordial fulness and dyspnœa, lobelia; marked periodicity, with moist tongue, open pulse, and freedom from nervous excitement, quinine; cadaverous odor of the secretions, potassium chlorate, etc.

The modern Eclectic recognizes no law of cure, and does not accept a remedy as a specific until the extended successful employment of it in some particular condition has given it the right to be so called. Empiricism and experimentation are the foundations of knowledge concerning each remedy denominated a specific medicine. The havoc wrought Eclectic pharmacy at the close of the formative period had now to be remedied. The school had been nearly shipwrecked on the shoals of commercial selfishness, as seen in the instance of the resinoids. Calamities often bring about future good, so in this instance the commercial mistakes of a few gave a renewed impetus to better the conditions of Eclectic pharmacy. Uncertain preparations were supplanted by definite medicines. As a result the school has now a materia medica and system of therapeutics much sought by the descendants of those who endeavored to block the efforts of the pioneer Eclectic, in his zealous contention for pure and representative medicines. Dr. Scudder, supported by Dr. King and others, advocated office pharmacy as a step toward a better knowledge of drugs and to secure definite remedies. Special attention was given green and freshly dried products. Formulas were published for the preparation of specific medicines. Finally, in order to secure the integrity of these medicines and protect them from conscienceless manufacturers, Dr. Scudder copyrighted the labels. These bore the title «Specific Medicines» and gave the specific indications for their use. The manufacture of medicines bearing these labels was entrusted to competent pharmacists and from that time the school has been free from objectionable pharmacy. Dr. Scudder advocated the use of specific medicines in the study of the relationship of medicine to disease expressions. The Eclectic of the formative period selected from other schools, but endeavored to improve. He substituted milder for harsher methods; he opposed the use of the lancet and blister, and the abuse of mercury and antimony salts. The modern American Eclectic advocates the use of kindly curative remedies, and the avoidance of depressing or depletive medication. He has been the pioneer in the study of the indigenous materia medica, with special reference to specific indications and specific uses of medicines employed. He contends for the best possible pharmacy so that the minimum amount of medicine may accomplish maximum results. Harmful medication as exemplified in excessive drugging he has consistently opposed, heroic over-drugging having been one of the most potent causes leading to the necessity for the establishment of an Eclectic school. He advocates liberality of thought, the highest medical education, the cultivation of professional dignity, and the ethics that govern gentlemen.

The position of the Eclectic school of medicine is now well established, and the attitude of malice and persecution formerly shown it by rival schools is fast becoming a memory. The school numbers upwards of 8,000 Eclectic physicians. For a period of about ten years this numerical relation has remained nearly stationary, but because of better facilities for teaching, enlarged literature, and harmony in the ranks of the school it has never occupied so favorable a position nor had a better outlook for the future than it has to-day. Never before in its history has it been so free from internecine bickerings, attacks by rival schools, and unpleasant entanglements and alliances. It challenges all ages in the wealth and completeness of its materia medica. Recognizing the merit of the work accomplished the regular profession in many localities now invites Eclectics to join its associations providing they drop their distinctive title. This the Eclectic is unwilling to do, believing that the school has earned the right to be regarded and recognized as a distinct sect in medicine. Its work in the special fields of materia medica and specific diagnosis and specific medication entitle it to this right. The Eclectic school has a strong national organization and numerous State and local societies. A national reform association was founded in 1829, and a second at Worthington, Ohio, in 1836. In 1848 the first National Eclectic Medical Association was organized in Cincinnati, Ohio, with Dr. T. V. Morrow as president, and it held annual sessions until 1858. The present National Eclectic Medical Association was organized at Chicago, Ill., in 1870, with Dr. John W .Johnson, of Connecticut, as president. It holds annual sessions, meeting in various cities throughout the United States. Eclectic practitioners now hold positions as examiners in the more important life insurance companies, and are not now debarred from the army medical service as in the earlier days of medical ostracism. No discrimination is now made against them as surgeons for the great railway systems. These recognitions have been earned in the face of vigorous medical opposition, by the consistent and honorable course pursued by the Eclectic school as a whole. A number of colleges recognized by the National Society are now actively teaching Eclectic medicine, among which may be mentioned: Eclectic Medical Institute of Cincinnati, Ohio, the parent school of medical Eclecticism, chartered in 1845. Eclectic Medical College of the City of New York, chartered in 1865. Bennett College of Eclectic Medicine and Surgery, Chicago, Ill., organized in 1868. The American Medical College, of Saint Louis, Mo., incorporated in 1873. The California Medical College, of San Francisco, Cal., organized at Oakland in 1879. Eclectic Medical University of Kansas City, Mo., organized in 1897. Lincoln Medical College, Lincoln, Nebraska, reorganized in 1889. Eclectic Medical College of Indiana, Indianapolis, Ind., organized in 1900. American College of Medicine and Surgery, Chicago, Ill., organized in 1901. The Georgia College of Eclectic Medicine and Surgery, at Atlanta, Ga., was organized in 1866, but did not become actively Eclectic until 1886, when it was recognized by the National Association. These colleges are well organized and ably conducted.

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Medicine Hat, a town in Alberta, Canada, situated on the banks of the South Saskatchewan River, 660 miles west of Winnipeg on the C.P.R. The Canadian Northern and Grand Trunk Pacific are (1912) constructing rapidly toward it. Population in 1901, 1570 and 1911 (Federal Census) 5,579; according to local census 10,000. It is a Divisional Point of the C.P.R. Handled 2,130 horses and 266 cattle last season. Is in the centre of a natural gas field, many wells being in operation at the present time for manufacturing and industrial purposes, as well as for domestic uses; the cost for the former is 5 cents per 1,000 cubic feet and for the latter 13½ cents per 1,000 cubic feet. Has large brickyards and a sewer pipe plant employing 200 men; rolling mills, linseed oil and paint factory, foundry, planing mills, bottling works; wholesale groceries and large flour mills producing 400 barrels per day; two elevators with a capacity of 60,000 bushels; stock yards, cement block plant, six banks, and two newspapers. The assessment in 1911 was $7,000,000; all utilities are owned by the corporation. Both the Dominion and Provincial Governments have recognized the central situation of Medicine Hat by selecting it as the site of important institutions. At a short distance west from the city is the Experimental Farm with large and modern buildings. The Farm consists of 640 acres and in addition to the various cereals usually raised on farms elsewhere, vegetables of all sorts are grown as well as different kinds of fruit trees. This Farm maintains, in addition, one of the largest Western herds of registered Jersey cattle. The city's resources of natural gas are said to total 30,000,000 feet daily and it claims a billion tons of coal to be within easy reach. It has 17 miles of water mains, 14½ miles of cement walks, 20 miles of graded streets.

Medicine Man, among the American Indians, South Sea Island tribes and other savages, a man supposed to possess mysterious healing powers. Among most savages the medicine man occupies much the same position as that held in civilized communities by two of the learned professions — medical and clerical. The medicine man is both priest and physician, and is at once the repository of all that a tribe knows, fears, and believes. In very low stages of human development, however, he is at best only a magician, dealing in terrors, possessed of occult powers, but laying claim to no special medical knowledge. Thus, among the aborigines of North Queensland, the tribal doctors do not attend on the sick — an invalid being cared for by wife or mother. They are not ostentatious, a medicine man being distinguished by no insignia save a small bag in which his talismans, death charms, and other «credentials» are carried.

Among the North American Indians medicine men are treated with great respect, and form a secret society with exclusive privileges and «exercise a terrible influence in degrading the people.» It is curious to find that, as in Australia, the Indian medicine men are chiefly concerned to do positive harm. In co-operation with good and bad spirits, they bring about the deaths of men or dogs at a distance. Among the Ojibways they are a kind of brokers in vengeance, and a coward or a hypocrite who wishes to be covertly avenged upon an enemy will bribe his tribal medicine man to employ the medical attendant of his victim. Then, if the victim dies, the instigators remain, unsuspected, and the actual perpetrator of the crime probably goes scot free. Indian medicine men affect to suck out poison from a patient's body, or they cough up an arrow point or small, sharp piece of stone or bone which they suppose has been transferred from him to them by the evil spirit of another sorcerer. The medicine men of the Eskimos are even more extravagant in their pretensions. They profess themselves able to change into wood, stone, or animal, or even to walk on the water, or to fly, but they make a condition, which is that «no one must see them.»

Medicine, Preventive. See Preventive Medicine.

Medill, mĕ-dĭl', **Joseph,** American journalist: b. New Brunswick, Canada, 6 April 1823; d. San Antonio, Tex., 16 March 1899. Having early removed to Massillon, Stark County, Ohio, he was admitted to the bar in 1846, practised at New Philadelphia, and in 1849–51 published at Coshocton the 'Republican,' a Free-Soil paper. In 1852 he established at Cleveland the 'Forest City,' a Whig organ, which in 1853 was united with the 'Free Democrat,' and called the *Leader.* In 1855 he sold his interest in the *Leader,* removed to Chicago, with two partners purchased the *Tribune,* advocated radical anti-slavery measures, and supported Lincoln in 1860. He was a member of the Illinois constitutional convention of 1870; United States civil service commissioner in 1871, and in that year was elected mayor of Chicago. In 1874 became editor-in-chief of the Chicago *Tribune.*

Medina, Jose Maria, hō-sā' mä-rē'ä mä-dē'nä, Central American politician: b. Honduras about 1815; d. Santa Rosa 8 Feb. 1878. He was president of Honduras in 1862–3 and was re-elected in 1864–6 and in 1870. The war with Salvador in 1871 disturbed his hitherto successful administration and at the next election he was defeated by the Liberal party who elected their candidate Arias. Defeated again by Leiva in 1874 Medina raised an unsuccessful revolt in 1875–6 and in 1877 a second revolt was punished with death by court-martial.

Medina, mẹ-dē'nạ, Arabia, the native Medinahal-Nabi or City of the Prophet, 248 miles northwest of Mecca, and about 105 miles northeast of Yembu on the Red Sea. It is celebrated for containing the tomb of Mohammed whence it ranks second to Mecca as a pilgrimage resort of Islam. It is situated in the most fertile spot of all Hejaz, with an immense plain extending south from it; in every other direction the view is bounded by hills or mountains. The town forms an oval, surrounded by a strong stone wall, flanked with towers, while on a rock, at its northwest side, stands the castle. Of its four gates, the east Bab-el-Misri, or Egyptian Gate, is remarkable for its beauty. Medina has no large buildings except the great mosque, two smaller ones, a college, and public baths. The houses are of stone, two stories high. Beyond the walls of the city, west and south, are suburbs consisting of low houses, yards, gardens, and plantations. These suburbs have also their walls and gates. The Mosque of the Prophet stands at the east side of the city, and resembles that at Mecca on a smaller scale. The tomb of the Prophet is enclosed with a screen of iron filigree, at the south side of which the pilgrim goes through his devotions, for all of which he pays, but is consoled with the assurance that one prayer here is as good as a thousand elsewhere. It is estimated that one third of the Mecca pilgrims go on to Medina, the pilgrimage to which may be performed at any time of the year. The inhabitants of Medina are mostly strangers who have settled and become naturalized in feelings, manners, and language. The population of Medina is supposed to be from 16,000 to 20,000, of whom 12,000 are within the walls. Since 1814 Medina has been the capital of the north pashalic of Arabia.

Medina, mẹ-dī'na, N. Y., village, in Orleans County; on Oak Orchard Creek, and on the Erie Canal, and on the New York Central & Hudson River railroad; about 35 miles northeast of Buffalo and 12 miles from Lake Ontario. The first settlement was made about 1830. In 1832 it was incorporated as a village. It is in a fertile agricultural region in which the chief products are grapes, apples, strawberries, and other fruits, and dairy products. In the vicinity are valuable sandstone quarries from which is obtained excellent building stone. The water-power is excellent and has been increased by a storage dam. Electricity is used as a power in manufacturing as well as for light. The chief manufactures are pumps, iron, foundry products, shirts, shoes, vinegar, flour, and furniture. It has a large trade in fruit and sandstone. The Medina Falls are visited annually by a number of tourists. The government is vested in a president and board of trustees. Pop. (1910) 5,683.

Medina-Sidonia, mā-dē'nā sē-dō'nē-ā, Spain, a city in the province of Cadiz, 23 miles by rail southeast of Cadiz, built in the form of an amphitheatre on a broad eminence, in the middle of an extensive plain, noted for its agricultural products and cattle rearing, which constitute the chief occupations of the population. A fine Gothic church, a town hall, and the ancestral palace of the famous dukes of Medina-Sidonia are the principal buildings. Pop. about 15,000.

Medina (mẹ-dī'nạ) **Series,** in geology, a term introduced by the New York Geological Survey for a subdivision of the Upper Silurian series, apparently the base of that system. It is named from Medina, New York; occurs throughout the Atlantic States; and includes shales, conglomerates and sandstones. For the Medina sandstone see LEVANT.

Mediterranean (med''ĭ-tē-rā'nẹ-ạn) **Sea,** the great inland sea between the continents of Europe, Africa, and Asia, the remnant — according to Prof. Suess — “of a great ocean which at an early geological epoch, before the formation of the Atlantic, encircled half the globe along a line of latitude.” From its eastern extremity in Syria to the Strait of Gibraltar it is about 2,200 miles long; its maximum width from Venice to the Bay of Sidra is 1,200 miles. The shores of Europe are on the north and northwest, those of Africa on the south, and those of Asia on the east. The Mediterranean is connected with the Atlantic by the Strait of Gibraltar, and on the northeast with the Black Sea through the Dardanelles, Sea of Marmora, and the Bosporus, which form a continuous waterway. It is irregular in shape, and by the projection of the south part of Italy, and of Cape Bon in Africa, and the interposition of the island of Sicily, is divided, near its centre, into two distinct portions, an east and a west. In addition to these, the other important subdivisions are the Tyrrhenian or Tuscan Sea, between the west coast of Italy and the islands of Sardinia and Corsica; the Adriatic Sea or Gulf of Venice, between the east coast of Italy and the west coast of Turkey in Europe and Dalmatia; the Ionian Sea, between the west coasts of Turkey in Europe and Greece, and the south part of Italy and the island of Sicily; the Ægean Sea or Archipelago, between Turkey in Europe and Greece on the west and Turkey in Asia on the east; and the Levant, which is usually understood to include the whole sea east of the island of Crete. The largest gulfs are, on the shores of Europe, those of Lion or Lyons, Genoa, Taranto, Lepanto, Koron, Kolokythia, and Salonica; on the shores of Asia, Adrymiti, Smyrna, Adalia, and Skanderoon; and on the shores of Africa, Sidra and Cabes. The largest and most important islands are Sicily, interposed, as already mentioned, between the two great divisions of the sea, Sardinia, Corsica, and the Balearic Isles, in the west division; and Cyprus, Rhodes, Crete, the Ionian Isles, and Malta, in the east division. The principal rivers which discharge themselves into the Mediterranean are the Ebro, Rhone, Po, and Nile; but its communication with the Black Sea entitles it to claim it as part of its basin, and, consequently, also the great rivers Don, Dnieper, Dniester, and Danube. Between Cape Bon and the Sicilian coast, where the sea is shallowest, the depth varies from 30 to 250 fathoms; but in almost all other places, particularly at a distance from the shores and islands, the depth is very much greater, the maximum depth in the eastern division being 2,150 fathoms, in the western division, 2,040 fathoms. Owing to the very narrow channel which connects the Mediterranean with the main ocean, there is very little tide; though in some places, as in the Ionian Sea, the Adriatic, on parts of the African coast, etc., a rise of more than 6 feet sometimes occurs. The prevailing winds are the southeast and southwest in spring, and the northeast and northwest during the rest of the year. They often rise suddenly and with great violence. The most remarkable are the historic Euroclydon or Levanter, mentioned in Acts xxvii. 14, a northeast wind of dangerous whirlwind characteristics; the Bora in the Adriatic; the Etesian and Tramantona in the Ægean; and the burning Sirocco from the African desert. The Mediterranean abounds with fish, and also furnishes the finest coral and sponge. The evidences of volcanic action along its shores are present in the active volcanoes of Vesuvius, Etna, and Stromboli (qq.v.). Consult Playfair, 'The Mediterranean, Physical and Historical' (1890).

Mediterranean Subregion, a zoogeographical district of the Nearctic Region, embracing the basin of the Mediterranean and the plains of Syria. Faunistically this region is allied to Europe rather than to Africa or Asia, from which it is separated by deserts. It includes many sub-tropical forms, rarely or never seen north of the Alps or south of the Atlas Mountains. See ZOOGEOGRAPHY.

Medjidie, mĕ-jēd'ē, a Turkish order of knighthood, instituted by the Sultan in 1852. It has been conferred on numerous foreign officers, soldiers, and seamen, who have taken part in wars on behalf of Turkey. The name is also given to a modern Turkish silver coin, value about 85 cents.

Med'lar, a small tree or shrub (*Mespilus germanica*) of the rose family and a native of southern Europe where, in the wild state it has thorns, but in cultivation it is thornless. It differs from various near relatives, such as apple and pear, in bearing solitary, large, white, terminal flowers upon leafy growths of the current season, and, like the quince, in having no detachable peduncle to the fruit in which the receptacles do not completely overgrow the ovaries. It is widely grown in Europe but much less in America. In Central New York it is fully hardy and produces well with no special care. The top-shaped fruit, which is about the size of a small pear, should be allowed to hang until after a frost, which mellows its austerity and assists the process of «bletting,» as ripening in cool dry rooms is called. When in a state of incipient decay the softened fruits are eaten by those who enjoy tart flavors, or are made into preserves.

Medoc, mā-dŏk, a wine which derives its name from a district of France, in the ancient province of Gascony. It is mostly covered with vines, which are cultivated with great care, and the wines produced from which have a high reputation. See WINES.

Medul'la, in botany, the pith of a plant-stem. See PITH.

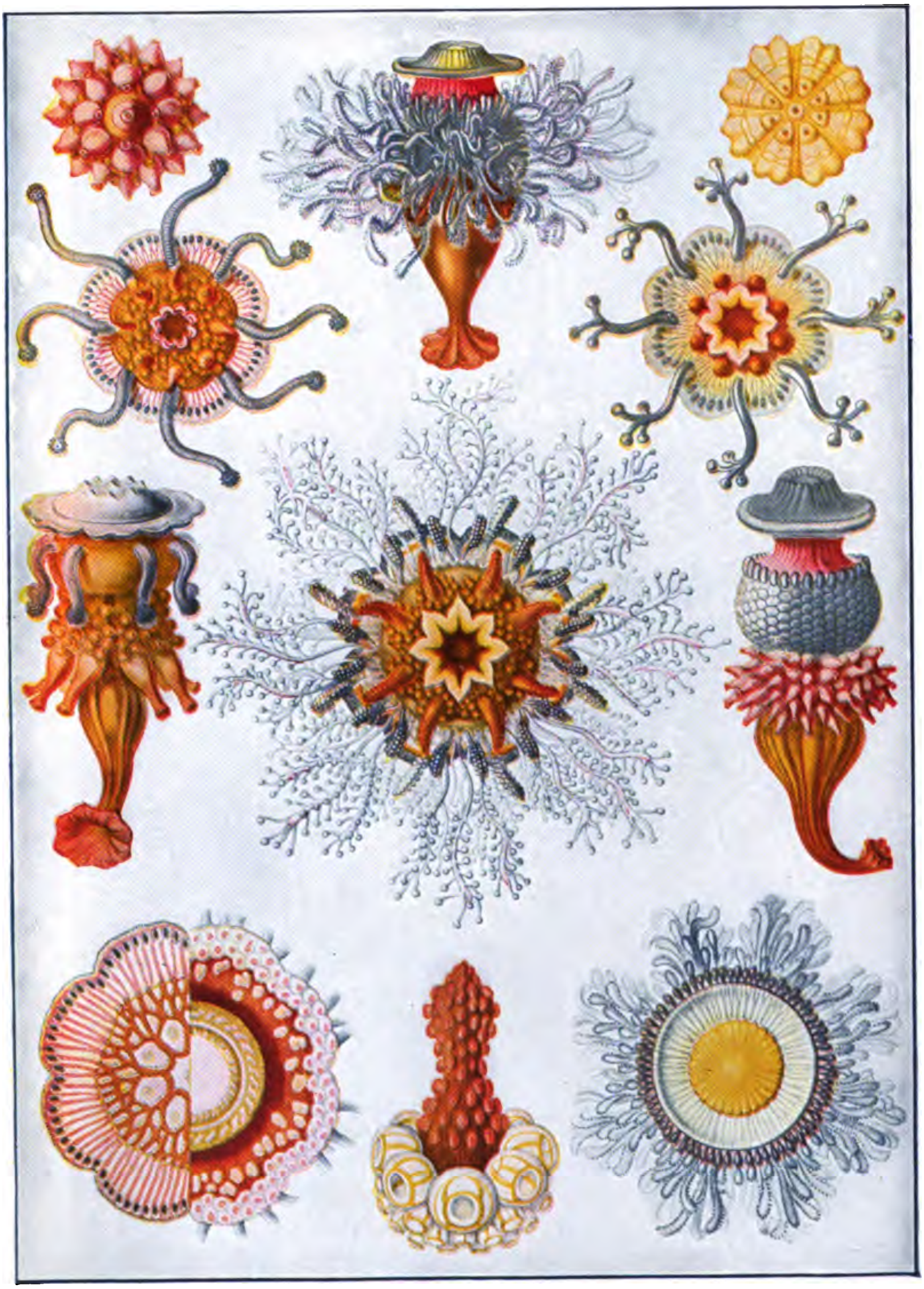
Medul'la Oblonga'ta, the brain-stem, or that part of the nervous system that lies between the *pons*, or *pons Varolii*, at the upper end, and the spinal cord proper, with which it is continuous, at its lower end. It is a very old part of the nervous system, judged from the standpoint of evolution, and in it are located the important centres of most of the cranial nerves, including the centres that govern the nerves of the heart and of respiration. It is a triangular cone-like portion of the nerve-axis, about an inch in length and one half to three quarters of an inch thick, being tubular below and flattened above. Below, it closely resembles the cervical cord in its internal construction, but above great changes take place to accommodate important new structures. One of the most conspicuous features of the medulla consists in a triangular enlargement of the central canal of the cerebro-spinal axis, constituting what is known as the fourth ventricle. The lower seven cranial nerves have their apparent origin in the medulla, and the first spinal nerve also originates in the medulla proper. The internal anatomy of the medulla is complicated. At the lower end the chief motor tracts, the pyramidal tracts that come from the motor area (q.v.) in the brain cross one another to pass down on opposite sides of the spinal cord. It is because of this decussation that a hemorrhage of the brain of the right side causes a paralysis of the muscles of the left side of the body, and *vice versa*. Just above the decussation of the pyramids the end-stations (nuclei) of the two chief sensory tracts of the body are located. It is into these nuclei — the gracilis and the cuneatus — that all of the sense-impressions from the body below the head are collected, to be passed to higher cerebral centres through the lemniscus or sensory fillet. The chief gray masses in this part of the brain are the nuclei of the cranial nerves referred to, and of the olives, two structures of undetermined function. The best description of the oblongata at present is that of the model of the medulla and pons by Dr. Florence Sabin, which is figured in Barker's 'Nervous System.' Consult also: Buck, 'Reference Handbook of the Medical Sciences,' article «Brain,» and Johns Hopkins Hospital Reports, Welch Memorial Volume. See BRAIN.

Medusa, mẹ-doo'sạ. See GORGO.

Medusa, a disk-bearing jellyfish (q.v.).

Med'way, England, a river which rises in the county of Sussex and flows northeast in a winding course across Kent, past Tunbridge and Maidstone, to Rochester and Chatham. Below Chatham it spreads out into a broad tidal estuary, in which are several islets, and joins the Thames at Sheerness. It is 70 miles long and is navigable to Penshurst, 20 miles above Chatham.

Meehan, mē'ạn, **Thomas**, American scientist: b. Potter's Bar, near London, England, 21 March 1826; d. Philadelphia 19 Nov. 1901. From his father, a gardener, he learned facts of natural history when a child; at 8 made and recorded an original discovery in herpetology; taught himself from books read at night after daily tasks; at 12 began to publish scientific papers; soon after produced the first hybrid fuchsia; and was nominated to membership in the Royal Wernerian Society. For two years he held a position at Kew Gardens. In 1848 he came to America and took charge of Bartram's Gardens in Philadelphia. In 1854 he established the Germantown Nurseries, which he conducted until the end of his life. For 30 years (1859–89) he edited the 'Gardeners' Monthly,' and contributed papers to many other periodicals and to scientific societies. For 23 years he was senior vice-president of the Philadelphia Academy of Natural Sciences, in whose proceedings were published his important 'Contributions to



MEDUSA LIKE ANIMALS

the Life History of Plants.’ In 1875 he was elected a fellow of the American Academy for the Advancement of Science, before which, among other noteworthy papers, he read ‘A Contribution to the Doctrine of Evolution and the Theory of Natural Selection,’ which showed him as a co-worker with Darwin and other evolutionary scientists, in whose field he also was a discoverer. From the creation of the office until his death he served as State botanist of Pennsylvania, at one time was a member of the board of visitors of Harvard, and was one of the American editors of the ‘Encyclopædia Britannica.’ His travels and researches extended throughout the country, including Alaska. In 1878 he began the publication of ‘Native Flowers and Ferns of the United States,’ an illustrated serial covering a wide field of floral distribution, the main features of which he continued in ‘Meehan's Monthly,’ founded in 1891. Many learned societies abroad enrolled him, and he held intimate relations with nearly all the leading scientists of his time. Among his closest friends was the Comte de Paris, a devotee of plant-study. Meehan was the third American to receive the Veitch medal, awarded to him for “distinguished services in botany and horticulture.” Apart from scientific work he devoted himself to public labors; was a member of the Philadelphia common councils from 1882 until his death; during the same period served on the local school board; in both capacities introduced many reforms; and chiefly through his efforts nearly 30 small parks were added to the city. A work of permanent value is his ‘American Hand-book of Ornamental Trees’ (1853).

Meek, mēk, **Alexander Beaufort**, American jurist: b. Columbia, S. C., 17 July 1814; d. Columbus, Miss., 30 Nov. 1865. He was graduated from the University of Alabama in 1833 and admitted to the bar two years after. He served in the Seminole War 1836; was attorney-general of Alabama 1836; judge of Tuscaloosa County 1842–4; and member of the legislature in 1853. While there he established the free-school system of Alabama. In addition to a legal digest (1842) he wrote: ‘The Red Eagle’ (1855); ‘Songs and Poems of the South’ (1857); ‘Romantic Passages in Southwestern History’ (1857); etc. His best known poem is ‘The Charge at Balaklava.’

Meek, Fielding Bradford, American palæontologist: b. Madison, Ind., 10 Dec. 1817; d. Washington, D. C., 28 Dec. 1876. His educational advantages were limited, but his interest in natural history made study imperative to him, and in 1848 he became assistant to David D. Owen in a geological survey of Iowa, Minnesota, and Wisconsin. He assisted James Hall at Albany in 1852–8, spending several summers in a geological survey of Missouri and Nebraska, and in 1858 went to Washington, where he devoted the remainder of his life to palæontologic investigations under the government. He was elected in 1870 to the National Academy of Sciences, and was a member of other scientific organizations. Among his writings are: ‘Check List of the Invertebrate Fossils of North America’ (1864); ‘Report on Invertebrate Cretaceous and Tertiary Fossils’ (1876); etc. For a complete list of his works, see bibliography published by the Smithsonian Institution.

Meer'kat. See SURICATE.

Meekins, mē'kĭnz, **Lynn Roby**, American journalist: b. Salem, Md., 14 Nov. 1862. He was graduated from Western Maryland College, Westminster, Md., in 1882, and devoted himself to journalism. He was literary editor of the Baltimore *American* 1882–9, when he became managing editor of the Philadelphia ‘Saturday Evening Post,’ and since 1903 has been editor of the Baltimore *Herald*. He has published: ‘The Robb's Island Wreck’ (1894); ‘Adam Rush’ (1902); etc.

Meeks, Eugene, American painter: b. New York 1843. He studied under Wust, at The Hague, and under Van Lerius at Antwerp. In 1883 he received the title of professor from the Academy of Florence, in which city he had made his permanent residence. His Venetian pictures include ‘Gondola Party’ and ‘Fishing Boats,’ and he has successfully handled a *motif* taken from Dickens, in his ‘Little Nell and Her Grandfather’ (1876).

Meerschaum, mēr'shâm or -shum, a name given to one of the silicates of magnesium; it is a mineral of a whitish or creamy color, and received its name from its appearance and the position in which it is sometimes found suggesting that it was petrified foam of the sea. It is obtained from various places, but the best quality comes from Asia Minor, rich deposits of it existing about 20 miles southeast of Eskichehir, at a place called Sepetdje. Here are some 20,000 pits in a space of six miles, of which only 150 are worked, all the others being exhausted. It is said that these mines were opened 1,000 years ago, which is not incredible, as it is well known that magnesia was formerly used for many purposes, other than the fabrication of pipes; moreover, fuller's earth used to be worked on a vast scale by the ancients. The meerschaum mines are worked by some 500 miners, who live in the surrounding villages. At Gheikli, in the neighborhood of Sepetdje, there are 3,000 pits, of which only 100 are worked, giving employment to 400 miners. The mineral is mined in blocks, which are taken to Eskichehir, where the blocks are cleaned, the operation consisting of scraping and cutting the blocks with a sharp instrument or knife, the meerschaum being still soft and easily cut into any shape or form. Over 1,100 persons are occupied in cleaning and shaping these blocks, which, after being thoroughly cleaned, are separated into four classes, according to size and quality. These blocks being ready for sale, a bargain is struck between the pipe manufacturers and the commission agents and merchants at Eskichehir, of whom there are about a dozen. The latter then pack the blocks of these four classes with very great care into boxes of equal size, each block being wrapped in cotton to avoid any friction or shock between the pieces. The actual annual output of these mines varies from 120 to 150 tons. It is soft when dug up, but becomes hard when dry. Most of it is sent to Vienna, where it is chiefly made into tobacco-pipes, many of them highly artistic. Similar pipes are also made in Paris, London, and elsewhere.

Mees, Arthur, American musical director: b. Columbus, Ohio, 13 Feb. 1850. He was graduated from Concordia College, Fort Wayne, Ind., and studied music in Berlin. He has been assistant director, and later director, of some of the leading operas and musical associations, and has published, in addition to his annotated programmes for the New York Philharmonic Society and the Chicago Orchestra, ‘Chorus and Choral Music.’

Megacles. The most illustrious Greek of this name was the head of the family of the Alcmæonidæ at Athens in the time of Solon. After twice expelling Pisistratus, who in 560 B.C. had made himself «Tyrant» of Athens, he was himself exiled by him together with all his family.

Megalensia or Megalesia, an annual festival at Rome (4–10 April) in connection with the foreign cult of Cybele, the *Magna Mater* or Great Mother of the Gods, celebrated by a procession of her eunuch-priests, by circensian and theatrical shows, and at the close a carnival.

Megalith'ic Monuments. See Dolmen; Menhir; Standing Stones; Stone Circles.

Megalopolis, mĕg-ạ-lŏp'ō-lĭs, or **Sinanon,** Greece, a ruined city on the ancient Helisson, in the nomarchy of Gortynia, 5 miles north of Leondari. It was founded 370 B.C. by Epaminondas, as the federal capital of Arcadia, and was frequently but unsuccessfully attacked by the Spartans. In 222 B.C. it was captured and partially destroyed by Cleomenes III. From 1890–3 the British School at Athens excavated the site and revealed the Precinct of Zeus Soter, the Agora, the Stoa of Philip and the Stoa of Myropolis on the right bank of the river, and on the left bank, the Theatre and Scanotheca, the Thersileon or great assembly hall, altars, and remains of other buildings described by Pausanias. Consult Schultz and Loring, ‘Excavations at Megalopolis’ (1892).

Megalosaurus, mĕg"ạ-lō-sâ'rŭs, a genus of huge carnivorous dinosaurs of the group *Theropoda.* Their remains occur in a fragmentary way in the European oölitic rocks. See Dinosauria.

Meg'aphone (a Greek word meaning «great sound»), an instrument devised by Thomas A. Edison for carrying the sound of the voice long distances without the aid of wires. It consists of two large funnel-shaped receivers in which the waves of sound are collected and concentrated and carried by means of flexible tubes held to the ears of the person using the instrument. In the instrument called telephone-megaphone, the mouthpiece of the telephone is connected with four transmitters which multiply the usual telephone sound of the voice by four, and it is sent by wire, so increased, into the megaphone, which sends it forth into space with sufficient intensity to carry it with perfect distinctness throughout a large church or hall. The ordinary megaphone is largely used by deaf persons.

Megapodes, a general name for the brush-turkeys or mound-birds of Australia constituting the gallinaceous family *Megapodiidæ,* so named in reference to the disproportionately large size of the feet; and remarkable for their breeding habits. The family, although mainly Australian, is represented in many of the South Sea Islands and in the Philippines, replacing the pheasants, which are absent from that region. There are 7 genera and 20 or more species, mostly with restricted individual ranges, and varying in size from that of a turkey to that of a large pigeon, the sexes being always alike in plumage. The general colors are browns and yellows with the naked wattled parts brightly colored. They have a short, strong bill; the head and neck almost naked and wattled; the wings short and round, the tail large; the legs and feet large, strong and provided with great claws. Megapodes are terrestrial birds found in hill-valleys, among thickets or along river and sea beaches. They run well, but if hard pressed will take to trees where they hop about awkwardly; their flight is heavy, but may be long sustained. Hoarse, chuckling, cackling or mewing cries express the utterances of the different species, which are often heard at night. The food consists of fallen fruit, seeds, berries, worms, snails, insects and even small crabs. The flesh is dark-colored and not good, though palatable to the Australian aborigines.

One of the best known species is the brush-turkey or mound-turkey (*Catheturus lathami*), also known as the wattled talegalla and the New Holland vulture, the latter name being given to it on account of its yellow, naked head and neck, covered in part with fleshy wattles. It is rather common in New South Wales, inhabiting the most thickly wooded parts. It is a large bird, about the size of a turkey, with blackish-brown plumage. It is shy, and when pursued, endeavors to escape by running through the thickest brush, or by leaping to the lowest branches of a tree, and thus avoids the dingoes or native dogs, which, however, often hunt it down on open ground. It is easy game to the sportsman, who finds it roosting under shelter of the branches of trees during the heat of the day, and although several of a flock are shot, the rest keep their place undisturbed. They are generally seen in small flocks, and make their nests together, the females heaping up, by means of their feet, mounds of several cartloads of earth and decayed leaves, which are used from year to year, new materials being added every year. The eggs are separately buried, often by several females, within the mass, where they are hatched by the heat of the fermenting mound. The parent birds partially uncover them during the day. Nearly a bushel of eggs may sometimes be found in a single heap. The male bird pays great attention to the young after they are hatched, covering them up partially in the mound at night for warmth. The flesh of the talegalla is excellent, and the eggs are also very delicate and eagerly sought after. Two other species occur in New Guinea.

South and West Australia have another familiar megapode in the mallee-hen or «native pheasant» (*Lipoa occellata*) — a large gray-brown bird with eye-like markings on the wings and back, and the naked neck and wattles blue; its mounds are comparatively small and often made individually. A bird often confounded with this in books because of similarity of name is the maleo (*Megacepalon malco*) of North Celebes, which has the singular habit of making a general migration in the breeding season to the sea-beach, where small groups of females dig large holes in the sand just above high-water mark, and day by day bury eggs there until the quota of each is laid; these gradually hatch under the influence of the hot sand. The largest genus is *Megapodius,* whose 15 species are scattered over all the island region between Samoa, the Philippines and the Micobars, each group having a distinct species. The most widely distributed and best known is *M. tumulus*, the common mound-bird or scrub-turkey of Northern Australia and the Papuan archipelago, which fashions mounds 10 or 11 feet high in the densest woods, continues to use them year after year, and lays pale, coffee-colored, thin-shelled eggs in straight burrows penetrating the mound. In some islands the eggs of these birds are an important food resource. The young are well fledged when they emerge from the egg and scramble out of the mound, but are attended to by their parents for some time. Consult Newton, 'Dictionary of Birds' (1896); 'Proceedings,' Zoological Society of London, 1876, 1888, etc., and works on the ornithology of Australia and Oceanica.

Meg"apolen'sis, Joannes, Dutch Protestant missionary to the North American Indians: b. Koedyck, Holland, 1603; d. New York 24 Jan. 1670. His family name, van Mekelenburg, he Hellenized to Megapolensis. In 1642 Van Rensselaer, the first Patroon, brought him to New York from Holland, and he soon learned the Mohawk tongue and preached successfully among the Indians near Albany, several years before John Eliot's mission or any other Protestant preaching to the Indians. From 1649 until his death he was pastor of the Dutch church in New York, where he showed little tolerance to Lutherans and Independents. He advised peaceable surrender to the English in 1664. His account of the Mohawks is published in the third volume of the New York Historical Society's 'Collections' (1870).

Meg'ara. See MEGARIS.

Megar'ic School. See MEGARIS.

Megaris, mĕg'a̤-rĭs, Greece, the name of an ancient state or small district bounded north by Bœotia, east by Attica, south by the Saronic Gulf and the territory of Corinth, west by the Corinthian territory and the Corinthian Gulf; area, about 143 square miles. It is a mountainous country, the only plain being that on which the capital was situated. Mount Cithæron was on the north boundary, separating it from Bœotia. The only important town was Megara, situated a mile from the sea, opposite the island of Salamis. It contained a Pelasgian citadel, called Caria, on a hill northwest of the city, with a temple to Demeter called Megaron, from which the name of the town is supposed to be derived. It had flourishing colonies at an early period, and its navy was so powerful that it was only after a long struggle with it that Athens obtained possession of Salamis. It afterwards became annexed to Attica, of which Megaris formed one of the four ancient divisions. It was successively conquered by the Dorians and the Corinthians, but afterward asserted its independence, and became wealthy and powerfu

Megasthenes, a Greek historian, who about the year 302 B.C., as ambassador of King Selencus Nicator at the court of the Indian king Sandracottos, gathered the material for a geographical and historical account of India that, reaching us in the form of fragments and worked over in Strabo, Diodorus, and Arrian, is our chief source of knowledge of that country in antiquity. An edition of the fragments by E. A. Schwanbeck (Bonn 1846). A translation by McCrindle, '*Ancient India as Described by Megasthenes and Arrian*' (Calcutta 1877).

Megathe'rium, a gigantic fossil ground-sloth, the largest known edentate, representing the family *Megatheriidæ*, and especially the species *Megatherium americanum*, whose remains are found plentifully in the Pleistocene strata of Argentina and Patagonia. These early edentates were so generalized, that, as compared with modern forms, they exhibit the head and teeth of a sloth, associated with the vertebræ, limbs and tail of the ant-eater. Some of them attain a gigantic size, at least as large as an elephant, but with shorter limbs and a bigger tail, and the latest species are the most bulky. *Megatherium*, according to Woodward, seems to have been entirely destitute of dermal armor. The only one of its allies in which bony plates have been discovered is *Mylodon*, and they are very small and not fused together. The mylodons were somewhat smaller than the megatheria, with a skull and teeth more like those of the modern sloths, and the three inner digits of the forefoot bear claws, about equal in size, instead of the huge middle-finger claw of the Megatherium. In both animals the hind foot lacks digit I., but II. and III. bear claws. The typical species of mylodon (*M. harlani*) was about as large and of much the same form as a rhinoceros, and inhabited the southwestern United States, while various other species lived in South America. The long-headed South American genera, *Scelidotherium* and *Megalonyx*, are other forms of the same family. Consult the palæontological writings of Leidy, Lydekker, and Woodward.

Megna, mĕg'na̤, or **Meghna, India,** the estuarine outlet of the Ganges and Brahmaputra (qq.v.), in Bengal. The tidal bore is characterized by its velocity, which endangers navigation, advancing at the rate of 15 miles an hour, and frequently attaining a height of nearly 20 feet.

Megrim. See MIGRAINE.

Mehemet, mä'hē-met, or **Mohammed,** mō-ham'ĕd, **Ali,** ä'lē, viceroy of Egypt: b. Kavala, Macedonia, 1769; d. Cairo 2 Aug. 1849. An orphan, he was brought up by a janizary captain, governor of Kavala, who married him to a kinswoman and made him a militia officer. When the French invaded Egypt he was sent there, rose rapidly, became the confidant of Koshrew, pasha of Egypt, and, by treachery both to the pashas and the Mamelukes and by a liberal use of his wealth, in July 1805 became pasha of Cairo, whence his power quickly spread over the rest of Egypt. His utterly unscrupulous policy was shown by his massacre of nearly 1,700 Mamelukes in 1811. He extended the limits of Egypt by wars on the Arabian Wahabees, by the possession of Nubia and Kordofan, and by the treacherous conquest of Syria, in which he aimed at independence of the Porte. This first break with Turkey was settled by the Powers; and in 1839 the Sultan was forced to call on the Powers to help him turn Mehemet out of Syria; by the treaty then concluded he surrendered Syria, Candia, and Hejaz; but was made hereditary pasha. His internal administration was vigorous; both agriculture and manufactures flourished, thanks to French capital solicited by Mehemet, who introduced European methods into his army also. He was insane during the latter part of his life, and was succeeded by his grandson; his son, who took his place as regent in September 1848, died in November of that year.

Méhul, Etienne Henri, ā-tē-ĕn ŏṅ-rē mā-ül, French musical composer: b. Givet (Ardennes) 22 June 1763; d. Paris 18 Oct. 1817. He studied at Paris under Gluck; and after the departure of the latter for Vienna, Méhul presented to the Royal Academy of Music the opera of ‘Cora and Alonzo,’ the representation of which was delayed for six years. He then turned to the Opéra Comique, which gladly received his ‘Euphrosine and Coradin’ in 1790. His patriotic hymns, ‘Chant du Départ,’ ‘Chant de Victoire,’ and ‘Chant Retour,’ greatly increased his fame. He was chosen a member of the Institute in 1796, of the Academy of Fine Arts in 1816, and a knight of the Legion of Honor in 1802. His chief operatic work is ‘Joseph’ (1807). His style as a composer is remarkable for dramatic force and coloring. There is a ‘Life’ by Pougin (1889). His statue was erected in his native town in 1892.

Meibo'mia, a genus of erect perennial herbs of the pea family, of which about 150 species are natives of warm and temperate America, Africa, and Australia. More than 40 species belong to the United States, some of the more familiar of which are called “tick-seeds.”

Meiggs, mĕgz, **Henry,** American contractor: b. Catskill, N. Y., 7 July 1811; d. Lima, Peru, September 1877. He was engaged in the lumber business in New York and other places but met with financial reverses and in 1848 went to California, where he again took to the lumber business and gained an immense fortune. Reverses, however, once more swept away his wealth, leaving him with an indebtedness of more than $1,000,000. He fled with his family to Peru, where he soon embarked upon a series of bridge- and railway-building enterprises, which won for him immense wealth and a world-wide fame as a railway contractor. His engineering achievements in South America comprise some of the most daring feats in the history of the profession. The construction of the Callao, Lima, and Oroya road, which crosses the Andes and ascends to a height only 136 feet lower than the summit of Mount Blanc, was his crowning achievement, and was practically completed at his death. He paid in full the enormous obligations incurred by his failure in San Francisco, contributed generously to charities in the United States and Peru, and by the laying out of a beautiful park, which he presented to the city of Lima, materially changed for the better the appearance of the city.

Meigs, Montgomery, American civil engineer: b. Detroit, Mich., 27 Feb. 1847. He was educated at Harvard and in Germany, and was for several years in the employ of the Northern Pacific railroad. Since 1882 he has had charge of the Des Moines Rapids Canal under the government. He is the inventor of a “canvas coffer-dam.” He also constructed the United States dry dock at Keokuk.

Meigs, mĕgz, **Montgomery Cunningham,** American military officer: b. Augusta, Ga., 3 May 1816; d. Washington, D. C., 2 Jan. 1892. He was graduated from West Point in 1836 and entering the engineering corps the next year was engaged in the construction of forts Delaware, Wayne, Porter, Niagara, Ontario, and Montgomery until 1852, when he took charge of the building of the great Potomac aqueduct. In 1860 he built Fort Pickens in Florida, and in 1861 was appointed quartermaster-general of the United States army and given rank as brigadier-general. He was promoted major-general in 1864, and in 1875–6 he was sent by the government to Europe to make an inspection of various staff-departments, the quartermaster's in particular. After his retirement in 1882 he was engaged in preparing plans for various public buildings in Washington. He was a regent of the Smithsonian Institution and of many scientific societies, and was at his death architect of the Pension building.

Meigs, Return Jonathan, American soldier and pioneer: b. Middletown, Conn., December 1734; d. at the Cherokee agency, Ga., 28 Jan. 1823. At the commencement of the Revolutionary War he raised a company of men and marched to the American camp at Cambridge, subsequently accompanied Arnold on his expedition against Quebec, where he was taken prisoner, and after his release was commissioned a colonel in the Continental army. He signalized himself by a brilliant expedition against a British post at Sag Harbor on Long Island, for which he received the thanks of Congress and a sword, and took a distinguished part in the capture of Stony Point under General Wayne, and elsewhere in the course of the war. In 1788 he emigrated to Ohio, and established himself at Marietta. In 1801 he was appointed by President Jefferson Indian agent of the Cherokees, among whom he passed the remainder of his life.

Meigs, Return Jonathan, American soldier and politician, son of the preceding: b. Middletown, Conn., November 1765; d. 29 March 1824. He was graduated from Yale in 1788, went to Marietta, Ohio, with his father in 1788 and rose to prominence there as a lawyer. He was chief justice of the Ohio supreme court 1803–4; served in the army as a brevet colonel 1804–6; was a judge in Louisiana 1805–6; and in Michigan for the two years following. After being senator from Ohio 1808–10 he was governor of that State for the next four years, in which period he was an active supporter of the war measures of 1812–14. He was postmaster-general of the United States 1814–23.

Meigs, William Montgomery, American lawyer and biographer: b. Philadelphia, 12 Aug. 1852. He was graduated from the University of Pennsylvania in 1872, studied law and was admitted to the bar in 1879. In addition to his law practice he has devoted much time to literary work and is author of ‘Life of Joseph Meigs’ (1887); ‘Life of Charles Jared Ingersoll’ (1897); ‘The Growth of the Constitution’ (1900); etc.

Meiklejohn, mĭ'k'l-jŏn, **George D.,** American lawyer: b. Weyanwega, Wis., 22 Aug. 1857. He was graduated from the University of Michigan in 1880 and established himself in a law practice at Fullerton, Neb., in that year. He held several public offices and in 1884 and 1886 was elected state senator. In 1889 he was elected lieutenant-governor of Nebraska and in 1893–7 served as member of Congress. He was appointed assistant secretary of war in 1897 and filled that post through the war with Spain, retaining his office after the resignation of Secretary Alger, until 1901, since which time he has been engaged in his law practice at Fullerton.

Meilhac, Henri, ŏn-rē mā-yäk, French playwright: b. Paris 25 Feb. 1831; d. there 6 July 1897. His work as a dramatist begun in 1855, was attended at first by scant success, but he finally became a favorite playwright. Much of his work was done with Halévy (q.v.). He furnished the book for Offenbach's 'Grande Duchesse,' 'La Périchole,' and 'Les Brigands,' and other works of that composer. Among his independent plays are 'Petite Marquise' and 'Décoré.' In 1888 he was elected to the Académie Française.

Meiningen, mī'nĭng-ĕn, Germany, the capital of the small Duchy of Saxe-Meiningen, in a narrow, well-wooded valley, on the Werra, 40 miles southeast of Erfurt. It is an attractive modern town with regular and handsome streets, having been practically rebuilt since the disastrous fire in 1874 which destroyed the old town. The principal buildings are the new town-house and the ducal palace with a church, private and public library, picture gallery, museum, etc., attached. The stock company of the local theatre which for sixteen years enjoyed a European reputation for the excellence of its acting and staging, was dissolved in 1890. The industries are only of domestic importance and include brewing, woolen and cotton-weaving. Pop. about 18,000.

Meiningen Company, a celebrated company of German actors, under the management of Duke George of Saxe-Meiningen and the actor Chronegk. They gained the highest reputation for the historical accuracy and beauty of their scenery, dress, and mounting. They appeared at Drury Lane Theatre, London, in 1881. The company was dissolved in 1890.

Meissen, mī'sĕn, Germany, a town of Saxony, founded by Henry I. in 922–33, 14 miles northwest of Dresden, on the left bank of the Elbe, at the confluence of the Meisse and Triebisch. It has a noble Gothic cathedral, of the 10th century; an old castle of the Margraves, erected in the 15th century on a precipitous rock above the town, recently restored, the Franciscan church, a large and magnificent edifice, used as the custom-house; the church of Our Lady, or city church; the ancient church of St. Nicholas; and other public buildings. The royal porcelain factory, first established by Boettcher (q.v.), and now at some distance from the town, is the great industrial establishment of the place; there are also manufactures of safety matches, stoves, iron foundries and machine-works, a jute-mill, breweries, etc. Meissen is the see of an archbishop. Pop. (1900) 20,123; increased (1901) to 31,432 by the incorporation of Cölln, a suburb; (1910) about 38,000.

Meissonier, Jean Louis Ernest, zhŏṅ loo-ē ĕr-nā mā-sō-nē-ā, French painter: b. Lyon, France, 21 Feb. 1815; d. Paris 31 Jan. 1891. He came to Paris in early youth and entered the studio of Cogniet, meanwhile forming his style on the Dutch masters as represented in the Louvre. He first attracted attention by his illustrations of the Bible, Bossuet's 'Universal History,' 'Orlando Furioso,' 'Paul and Virginia,' etc. His earliest paintings in genre to be exhibited in the Salon were 'The Little Messenger' and 'The Chess Player' (1836). His reputation grew rapidly on the successive appearance of 'The Monk' (1838); 'The English Doctor' (1839); 'The Chess Party' (1841). The times of Louis XIV. and Louis XV. with all the accessory richness and variety of costumes, weapons and domestic luxury, began to find in him their most successful delineator. In the many canvases which he produced in this narrow department of genre he showed a keen and strong, but not too florid, power of characterization, which was accompanied with a marvellous technique in the handling of stuffs, metals, etc. But modern history eventually claimed his attention and he found a congenial field for the exercise of his special gifts in the campaigns of Napoleon. His pictures were often small, but finished with minute and delicate virtuosity, a good example of which may be seen in his 'Cuirassiers of 1805'; but he is perhaps less successful in large canvases and elaborate figure compositions than in his small paintings. Among his most famous pictures of the Napoleonic cycle are 'Napoleon I. with his Staff' and 'Napoleon III. at Solferino' (1864); 'Napoleon I. at Friedland' (1875), now in the Metropolitan Museum of New York. In his latter days he painted Venetian scenery and architectural views with his usual dash, thoroughness and originality. In his works he shows the best qualities of the Dutch school with all its life-like expression, truthfulness and spirit combined with the delicacy of French sentiment and abandon. His water colors, etchings and lithographs bear admirable witness to his versatility and vigorous industry. His pictures have always fetched a high price, 'Friedland or 1807' having been sold for $60,000, a sum scarcely disproportionate to that given for smaller canvases. He is to be looked upon as the founder of the new school of military painters represented by his son Jean Charles Meissonier and Edouard Detaille, his most illustrious pupil. Consult: Claretie, 'Meissonier' (1881); Larroumet, 'Meissonier' (1893).

Meistersingers, mīs'tėr-sing ėrz, or **Master-Singers** (German, *Meistersinger*), a society of German singers formed in the 13th century. During the long evenings of winter the worthy burghers of the German cities assembled to read the poems of the minstrels. Some of the hearers were naturally led to try their own skill in verse; others followed, and the spirit of the age soon embodied these votaries of the muse into societies after the fashion of corporations. Charles IV. gave them a charter and a coat of arms. They met on certain days, and criticized each other's productions, in which external correctness seems to have appeared to them the chief object; few, indeed, had an idea of the difference between poetical and prosaical ideas or expressions. Their attempts in the lyric style were chiefly limited to spiritual songs; in the epic to rhymed versions of the scriptural narratives. They were also fond of the didactic style. The rules by which the members of the societies were to be guided as to the metre, etc., of their compositions were written on a table, and called *tabulatur,* for the sake of enforcing a strict observance of purity in language and prosody. The chief faults to be avoided were collected; they were 32 in number, and distinguished by particular names. He who invented a new metre invented also a new tune, the names of which were the drollest and sometimes the most senseless imaginable. Besides their stated meetings they held public meetings, generally on Sundays and festivals in the afternoon in churches. In Nuremberg, where the master-singers flourished particularly, such meetings were opened with free singing, in which anybody might sing, though not belonging to the corporation. In this the choice of the subjects was left comparatively uncontrolled; then followed the chief singing, when only those who belonged to the corporation were allowed to sing, and only on scriptural subjects. The judges were called *Merker,* and sat behind a curtain. There were four: one watched whether the song was according to the text of the Bible, which lay open before him; the second whether the prosody was correct; the third criticized the rhymes; the fourth the tunes. Every fault was marked, and he who had fewest received the prize, a chain with medals. Whoever had won a chain was allowed to take apprentices, to have many of whom was a great honor. Money was never taken from apprentices. After the expiration of his poetical apprenticeship the young poet was admitted to the corporation, and declared a master after having sung for some time with acceptation. These strange societies originated toward the end of the 14th century at Mainz, Strasburg, Augsburg, and continued in several free cities of the empire until the 17th, in Nuremberg to the 18th century, where probably the renown of Hans Sachs (q.v.), the famous shoemaker and poet, kept them longer in existence. The last society of the kind was that of Ulm, which was dissolved in 1839.

Mejerda, mĕ-yĕr'dạ, the ancient Bagradas, a river of north Africa, formed by the union of several head-streams rising in the Atlas Mountains in Algeria, and flowing through Tunis to its outlet in the Mediterranean, 24 miles north of the city of Tunis. The mass of sediment which it brings down has enlarged its delta and changed the coast line, its mouth formerly being at Bu-Chateur, seven miles southward. Its whole course is about 200 miles.

Mekong, mā-kŏng', or **Cambo'dia,** a river of Indo-China. See Cambodia.

Mela, mē'lā, **Pomponius,** a geographer who flourished during the 1st century of the Christian era, probably under the Emperor Claudius. Little more is known of him than that he was a native of Spain, and the author of a treatise in three books in the Latin language, 'De Situ Orbis,' containing a concise view of the state of the world so far as it was known to the ancient Romans. Mela is edited by Tzschucke (1807), Parthey (1867), and Frick (1880).

Melam'pus, in Greek mythology, son of Amythaon, who was the first mortal endowed with the gift of prophecy, and who first practised the medical art. He is said to have introduced the worship of Bacchus into Greece.

Melancho'lia. See Insanity.

Melanchthon, Græcized name of Philipp Schwarzerd (Eng. «black earth»), German reformer: b. Bretten in the Palatinate 16 Feb. 1497; d. Wittenberg 19 April 1560. He was left an orphan in his 10th year and taken into the house of his grandmother, a sister of Reuchlin (see Reuchlin, Johann) the great German humanist, by whom he was affectionately treated and encouraged in his studies. In his 12th year he entered the University of Heidelberg and two years later was graduated bachelor. While he was occupied as tutor to the son of Count von Löwenstein, he continued to give attention to his own progress in Greek; in 1514 was made master of arts at Tübingen and thenceforth devoted himself to humanism, lecturing on Cicero, Terence and Greek grammar. He also gave much time to the study of theology, jurisprudence and medicine. Here he first became acquainted with Erasmus' edition of the New Testament, and was through the influence of Reuchlin elected professor of Greek in the newly founded University of Wittenberg. He delivered an inaugural address (29 Aug. 1518), 'De Corrigendis Adolescentiæ Studiis,' which produced a revolution in German educational methods and above all met with the approbation of Luther, professor of philosophy at Wittenberg. From this time Melanchthon became 'Preceptor Germaniæ' (The Schoolmaster of Germany), and the 'Ally of Luther.' These two champions of the Reformation were brought still closer together by their union at the 'Leipsic Disputation' (1519) in which they were confronted by Dr. Eck (see Eck, Johann von) the great opponent of Luther and the movement he was inspiring. In his handling of this adversary, both orally and by his writings, Melanchthon showed himself to be the leader of Protestant controversialists and the most learned, judicious and ready of Protestant disputants.

In 1520 he married Katharina Krapp, daughter of the burgomaster of Wittenberg, and «Master Philip,» as he was familiarly called, as he settled down to domestic life, was placed on the theological faculty of the university, and the first fruit of his increased application to theological study and teaching was his 'Loci Communes Rerum Theologicarum,' which was the first declaration of the Protestant position delivered in formal terms of dogmatic theology. The volume ran through 60 editions in his life time, and established its author's position as Luther's complement — in some respects the lesser spirit of the Reformation movement, but the scientific talent which supported on the intellectual side the genius and the faith of Luther. Melanchthon, by his historic learning, by his power over the classic languages, was enabled to communicate to the learned world the real principles of the new movement and the facts of the past on which it was founded. He brought to bear his deep knowledge of theological philosophy, his acquaintance with the precise terms in Greek and Latin of scriptural, patristic and scholastic statement on the main question of the dispute, and he had the calmness of the well-balanced humanist which enabled him to direct with cool and even mind the movements of his party and to keep it as free as possible from the fury and blindness of intolerance. His knowledge of Greek made him as useful to Luther in translating the Bible as Parnell was to Pope in the production of his 'Iliad.' His pen had an immense influence in securing the after success of the initiative taken by bolder but less cautious and reasonable spirits, and left a mark on the German Reformation deeper, more permanent and characteristic than that of any among his most enthusiastic contemporaries. His 'Epitome Doctrinæ Christianæ' became from the first an influence which establishes its claim to be called the pandect and code of European Protestantism.

The spirit of Melanchthon was distinctly irenic. The Reformation had resulted not only in a German revolt from the papacy, but in the creation of a host of jarring Protestant sects. Melanchthon's broad and far-seeing spirit was averse to division of any kind. The Augsburg Confession which was presented to the diet in 1530 surprised even the Roman Catholics by its moderate tone. It was drawn up by Melanchthon in accordance with memoranda supplied by Luther and it has all the breadth, calmness and judicial cautiousness of Luther's friend and good genius. But this spirit of compromise, hopefulness and patience was out of harmony with the passion for controversy which made Wittenberg a centre of storm and strife. Melanchthon, however, stuck to his post at Wittenberg long after the great power and influence he once wielded had passed from him, into the hands of more positive, violent and aggressive leaders. There occurred a breach between the Philippists, the followers of Melanchthon and the Lutherans, who adhered to the extreme views of his friend on the subject of free will and irresistible grace, on the doctrine of the Lord's Supper, and on the «adiaphora» indifferent matters, as the former was inclined to term the ceremonies of the Roman Catholic Church. He and his followers were assailed as «rogues» and «worshippers of Baal.» Luther stated his own views on the sacrament with such violence that the recollection of his 'Short Confession respecting the Lord's Supper' filled him with remorse on his death bed, where he acknowledged to his friend «Dear Philip, I confess to have gone too far in the affair of the Sacrament.» The death of Luther left Melanchthon to the mercy of such zealous and fiery sectaries as had been engendered in that teeming period of intellectual and theological movement, which the monk of Wittenberg had inaugurated. He survived Luther four years, waiting for death, he said «as a refuge from the phrenzy of theologians,» and praying that the Protestant world might find its way at last to reunion, a prayer which as yet remains unfulfilled.

Melanchthon's important part in the Reformation movement has often been lost sight of in the blaze of Luther's more striking and popular personality. Yet he may with some reason, be called the brains of the Reformation. More than that, he was a man who, while he stood for progress, was averse to revolutionary change. In one sense he was the Mirabeau of a religious revolution, a constructive rather than a destructive reformer, a man born in a generation, which he could only affect by presenting an example of intellectual refinement, moderation, tolerance and conservation, which the warring giants of the Reformation refused to follow. In 1865 a statue was raised to him at Wittenberg, and in 1883 a group comprising Melanchthon and Luther at Leipsic. His works are found complete in 'Corpus Reformatorum,' 28 vols. (1834–60). Consult: Schmidt, 'Philipp Melanchthons Leben und ausgewählte Schriften' (1861); Richards, 'Philipp Melanchthon' (1898); Neander, 'Vita Quattuor Reformatorum' (1846).

Melanesia, mĕl-a̤-nē'shĭ-a̤, a collective name for the group of islands in the Pacific Ocean inhabited by dark-skinned races, as distinguished from the lighter complexioned inhabitants of Micronesia and Polynesia (qq.v.). As such Melanesia comprises the islands stretching from the northeast of New Guinea to the tropic of Capricorn, and include Bismarck Archipelago, the Admiralty Islands, Solomon Islands, Queen Charlotte or Santa Cruz Islands, New Hebrides, New Caledonia, Loyalty Islands, and the Fiji Islands. The Melanesians (Black Islanders) are ethnographically allied to the Negritos more nearly than to the Polynesians, but their dialects are more closely related to the speech of the latter race.

Melane'sians, a collective name given the native inhabitants in the southwestern islands of the Pacific Ocean, including the Fiji Islands, New Caledonia, Solomon Islands, etc. In race and language, as well as in folk-lore and tribal customs, the Melanesians appear to have affinities with the Malays and Polynesians. The people vary in color from dark-brown to black.

Mel'anism, an excess of pigment in the skin and its appendages, producing real or comparative blackness; the opposite of albinism (q.v.). Melanism is less frequent than albinism, but more inclined to affect large numbers of individuals of a species, forming melanistic varieties. A conspicuous example is afforded by the American «black» squirrels, which are melanistic varieties of various species, especially the fox-squirrel (*Sciurus niger*) and the gray squirrel (*S. carolinensis*). These varieties prevail in certain parts of the country, as the region of the Great Lakes and upper Mississippi Valley, and rarely occur elsewhere. Thus a black squirrel is almost unknown in New England or the Hudson Valley. Another familiar example is found in the black leopards, which in a direct light seem absolutely black, but under reflected light betray a pattern of spots similar to those of the ordinary leopard. Such examples, as is the case with other melanistic animals, often occur in the same litter of young with normal forms. In many of the lower animals, as butterflies, melanistic tendencies are developed under certain conditions, especially of excessive moisture. The dark color of the negroid human races is of this nature, and is greatest in those inhabiting warm moist regions. The pigments in the skin are mainly of the class called Melanins, which produce dark hues. Total abnormal melanism in man is unknown, but cases of partial melanism are on record. In one instance one half of the face was white, the other black. The cause of this condition is unknown. Melanoderma, chloasma, and liver-spots are terms applied to irregularly shaped yellow, brown, and black colorations of the skin. Some of these spots are due to scratching following the bites of body-vermin, to prolonged pressure upon a portion of the skin, prolonged use internally of preparations of silver, to racial admixture, general diseases, such as cancer or tuberculosis, etc. See COLORING MATTERS; COLORATION, PROTECTIVE.

Mel'anite (Gr. «black»), a very blackish variety of garnet, especially the lime-iron variety, in which lime largely preponderates in the protoxides. Melanite occupies a place midway between schorlomite and the garnets pure and simple; this is notably true of the sort containing the rare element titanite (q.v.). The group includes all the darkish garnets, with the exception (made by Dana) of the precious garnet, technically the pyrolite, which varies from red to black. With the green demantoids the blackish melanites make up the greater part of Dana's second class of garnets, the iron garnets. See, also, Garnet.

Melanorrhœa, mel″ạ-nō-rē′ạ. See Varnish Tree.

Melano'sis. See Tumor.

Melan'terite (Gr. *μελάντερος*, «blacker»), in mineralogy, the hydrous sulphate of iron; iron vitriol. It is the native form in which copperas occurs, is green in color and has a glassy lustre.

Melas'ma (Gr. «black spot»), a disease marked by discoloration of the skin. The term is rightly used in connection with a pigmentation of the skin, sometimes diffuse (color varying — dusky yellow, greenish brown, or even black), and believed to be dependent upon degeneration of the suprarenal capsules or the semilunar ganglia (see Addison's Disease). Sometimes the term is applied to the conditions known as liver-spots and «moth-patches.»

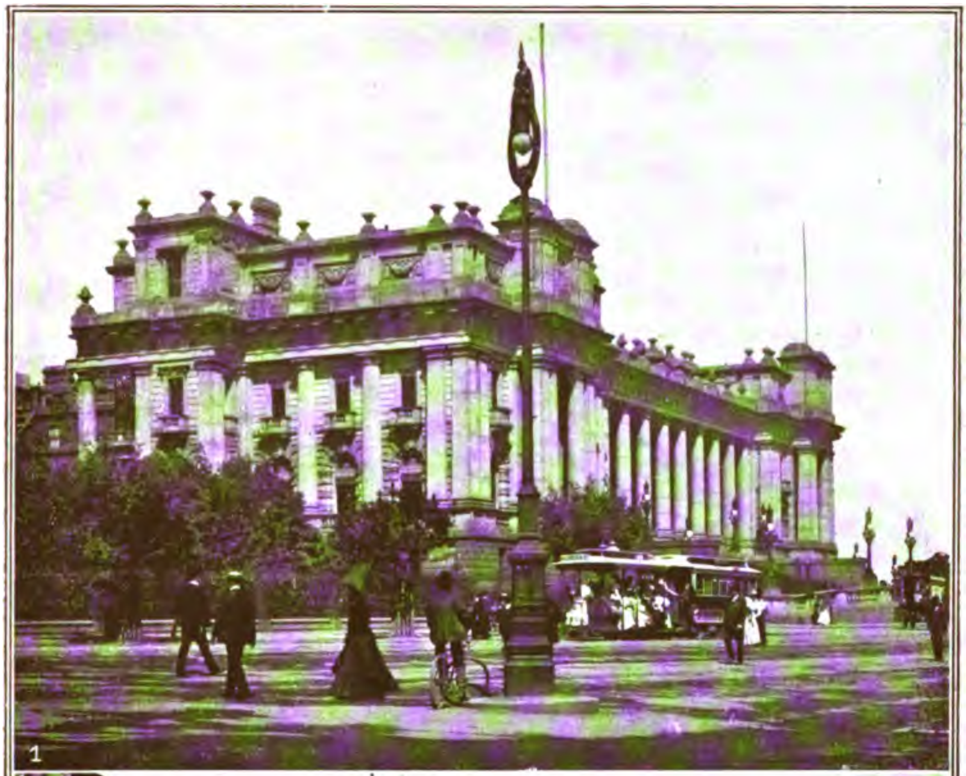
Melastoma'ceæ. See Deer Grass.

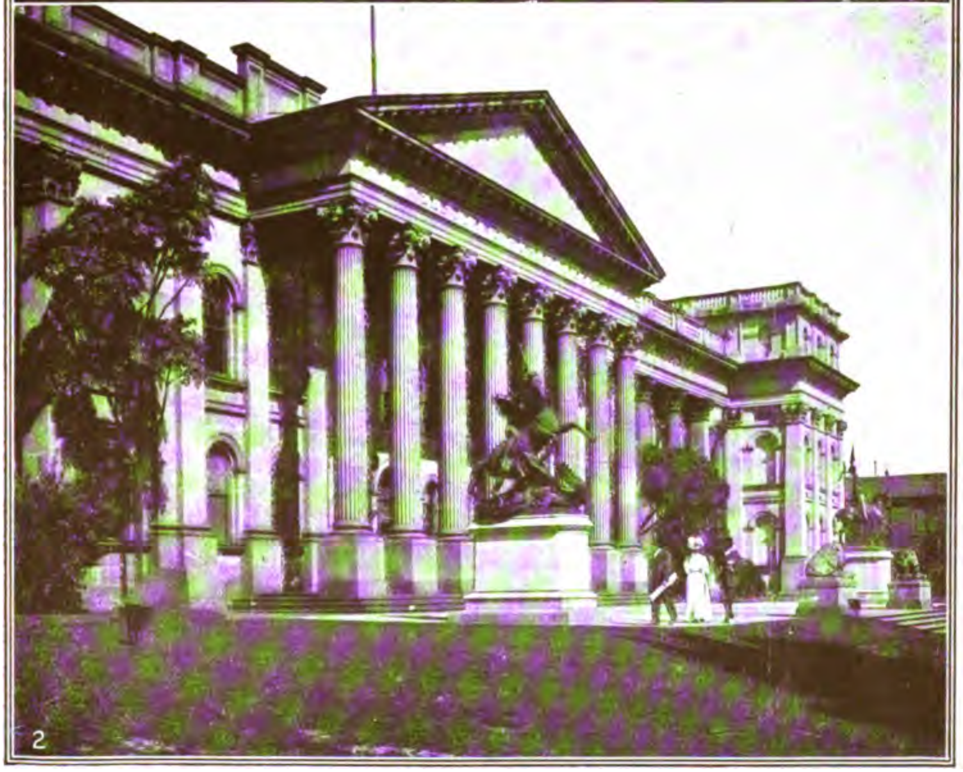
Mel'ba, Nellie, Australian prima donna: b. Melbourne 19 May 1865. She studied there in the Presbyterian Ladies' College; then took up music under Marchesi in Paris. On 15 Oct. 1887 she made her début in Brussels in ‹Rigoletto›; at that time gave up her family name Mitchell and took the stage name Melba, which is said to have been suggested by the name of her native city; in 1889 appeared in Paris at the Opera, where she stayed for three years, during which she appeared in London in Italian répertoire; and after 1892 toured Europe and America. Her best roles are Ophelia, Juliette, Lucia, and Nedda in ‹I Pagliacci.› She was married to Charles Armstrong in 1882.

Melbourne, mĕl'bĕrn, **William Lamb,** Viscount, English statesman: b. 15 March 1779; d. 24 Nov. 1848. Carefully trained by his mother, he entered Eton in 1790, Trinity College, Cambridge, in 1796, and Lincoln's Inn in 1797; studied law in Glasgow; was called to the bar in 1804; and in 1805 was elected to the House of Commons, where he followed Fox, leader of the opposition. He lost his seat in 1812 because of his vote for Catholic emancipation; was returned in 1816; served as chief secretary in Ireland in 1827; and in 1828 entered the House of Lords upon his father's death. Only then did he begin to figure in politics, and that only because of his popularity, for he had no official ability, being neither diligent nor brilliant. As home secretary under Grey in 1830 he was a failure; but in July 1834 the king induced him to form a ministry, and again in 1835, in spite of the king's effort to foist Peel on the country in November 1834, he became premier. He remained in office until August 1841, thus covering the early years of the reign of Victoria, whom Melbourne ably instructed in the duties of her position. His tuition of the young queen seems, however, the only event of his long administration, and he must be classed rather as a politician than as a great statesman, since he was scarcely more than indifferent to the reform measures of the day. He was a man of much learning, of a rather attractive, though coarse and habitually profane, wit, and of a strange admixture of constitutional conservatism and political liberalism. His wife, Lady Caroline Ponsonby, whom he married in 1805, was separated from him in 1825; she wrote several novels and was a friend of Lord Byron. See Norton, Caroline Elizabeth.

Melbourne, Australia, the capital of the state of Victoria, and the largest city of Australasia, situated around Hobson's Bay, at the northern extremity of Port Phillip, 40 miles north of its entrance from the ocean between Points Lonsdale and Nepean. The city and its numerous suburbs occupy an extensive undulating area, with the Yarra River, a stream of no great size, winding through it. The central and most important business part of the city is on the north bank of the Yarra, two miles by a direct railway line from the river's outlet in Hobson's Bay, but nine miles by the meandering water route. The city is built on a rectangular plan with fine wide streets lined with handsome and substantial public buildings and residences. Numerous lines of railway connect with the interior and the extensive suburban districts, which include such important places as Collingwood, North Melbourne, Fitzroy, Carlton, Brunswick, South Melbourne, Richmond, Prahran, St. Kilda, Port Melbourne, etc. The city is well lighted, and paved, and is abundantly supplied with water, but the drainage, although much has been done toward its improvement, is still defective. Street railways traverse all the principal city and suburban thoroughfares. The public buildings are noteworthy. The Houses of Parliament form a remarkable pile with a splendid west façade. Government House is a palatial building conspicuous from every part of the city, with a tower 145 feet high. Other public buildings include the law courts, forming an extensive square, the post-office, the custom-house, the treasury, the land and mining offices, the mint, the free library with some 300,000 volumes; the university, with an admirable museum belonging to it and a splendid hall (the Wilson Hall) in the Gothic style; the Ormond Presbyterian College; the town hall, with a large assembly room containing a splendid organ; the exchange, athenæum, theatres, etc. The ecclesiastical buildings include an Anglican Cathedral, a Roman Catholic Cathedral; the Scots church, with a fine steeple; and several other fine churches. There are several «sky-scraper» office and store buildings; many banks and business premises are attractive; and the Exhibition building deserves notice. At the head of the educational institutions is Melbourne University, with which are affiliated the three denominational colleges, Trinity (Episcopal), Ormond (Presbyterian), and Queen's (Methodist). Charitable and benevolent institutions are numerous. There are several parks and other grounds for public recreation, and among these the Botanic Garden deserves special notice on account of its extent (100 acres), its beauty, and the value of its collection of trees and plants. The beautiful Fitzroy Gardens also deserve special mention. Melbourne is the see of a Roman Catholic archiepiscopate and of an Anglican bishopric. The United States is represented by a consul-general. The chief industrial products of Melbourne are leather, furniture, clothing, flour, ales, cigars, ironware, woolens, etc. The shipping trade is large both in

AUSTRALIA.





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1. Parliament Building, Melbourne.
2. Public Library, Melbourne.

exports and imports, the chief of the former being wool and gold, of the latter manufactured goods. Most imports are subject to a heavy duty. There is access to Richmond above the centre of the city for fairly large vessels by the Yarra. Its navigation has been much improved recently and the Coode canal shortens the passage. The largest vessels are accommodated at Port Melbourne and Williamstown, both on Hobson's Bay; Port Phillip Bay affords unlimited anchorage for the largest vessels. Pop. of Melbourne city about 110,000, and including the sixteen suburban municipalities 549,200. The first settlements on the site of Melbourne were made in 1835, and a year or two after it received its present name, being so called after Lord Melbourne, who was then British prime minister. It was incorporated in 1842, and became a bishop's see in 1849. In 1851 it became capital of Victoria (then established as a separate colony), and received an immense impetus from the discovery of gold fields. Its shipping during 1908 was — imports 498,720 tons, exports 244,526 tons.

A centennial exhibition was held in 1888 in celebration of the founding (in 1788) of the Australian colonies. A great conflict between labor and capital took place in 1890, and a strike by the labor-unionists took place on a very extensive scale both in Victoria and New South Wales. In 1892-3 Melbourne suffered severely from commercial depression, financial crises, and banking disasters. The first Parliament of the Commonwealth of Australia was opened in the Exhibition Building on 9 May 1901, by the Duke of Cornwall and York. At a recent conference of the Premiers held at Melbourne the «Braddon clause,» providing that the several states receive at least three-fourths of the Commonwealth's revenues, was changed so that 25s. per capita be the amount. Consult: 'Victoria and its Metropolis, Past and Present' (1889).

Melchers, Paulus, German cardinal: b. Münster, Westphalia, 6 Jan. 1813; d. Rome 14 Dec. 1895. He studied law at Bonn, and theology at Munich and Münster; was ordained priest in 1841; in 1857 became bishop of Osnabrück; and in 1865 Pope Pius IX. nominated him archbishop of Cologne. At first opposing the doctrine of papal infallibility at the Vatican Council, Melchers afterward acccepted it, in agreement with the majority, and dealt severely with professors who sought to prevent its declaration. In the Kulturkampf (q.v.), his conspicuous activity brought him into collision with the representatives of government, and in 1876 he was removed from his archbishopric. His writings include 'Eine Unterweisung für das heilige Altarsakrament' (1878); 'Die katholische Lehre des Herrn' (1883); and 'Das Leben der allerseligsten Jungfrau und Gottesmutter' (1884).

Melchites, mĕl'kīts, those Christians of western Asia and of the Levant who acknowledge the supremacy of the Roman Pontiff, and accept the dogmas of the Roman Catholic Church. The Syriac and Egyptian congregations of this name in the main belong to the Greek Church though in some unimportant matters of ceremony and discipline they take an independent course. They are, however, under a chief bishop of their own, who is styled Patriarch of Antioch. The term Melchites is a nickname. It means «Royalists» and was given to them by the orthodox Greeks with the implication that they accepted the decrees of the Council of Chalcedon merely at the dictation, or in conformity with the example of the emperor. Celibacy is imposed upon their bishops, but their priests are at liberty to marry. Their liturgy is in the Arabic language; they use unleavened bread in the Eucharist and in their monastic houses they follow the Basilian rule. Consult Neale, 'History of the Eastern Church.'

Melchizedek, mĕl-kĭz'ĕ-dĕk («king of righteousness,» that is, righteous king), in the story of Genesis, king of Salem and priest of «Supreme God.» He met Abram on his return from the victorious expedition against Chedorlaomer, gave him his blessing, and received tithes from him. The ante-legal king-priest stands in Psalm cx. as a figure typical of the Messiah the vicegerent of Jehovah, and in Hebrews vii. 3, of the kingly priesthood of Jesus. The chapter in Genesis containing his story is a unique passage of the Pentateuch, and according to Wellhausen is one of its latest additions. Ewald counts it the earliest portion of the history, and based on old Canaanitish records; others, as Nöldeke, explain it as utterly unhistorical.

Melchthal, mĕlʜ'täl, **Arnold von** (Arnold an der Halden), Swiss patriot. He is considered by some authorities to be a mythical character but was supposed to have lived in the 14th century. He incurred the wrath of the governor and was compelled to flee to escape punishment, whereupon the governor seized Arnold's aged father and had his eyes put out. The son, enraged at this barbarity, with two friends planned a revolt against the Austrian power which they successfully conducted. Consult: Ægidius Tschudi, 'Chronicon Helveticum' (1505-72).

Meldom'eter. See Melting Point.

Mel'drum, David Storrar, English author: b. Kirkcaldy, Scotland, 29 Aug. 1865. He was educated at the Edinburgh High School, soon after became a journalist, and has been for several years literary adviser to Blackwood & Sons.

Melendez Valdes, Juan, hoo-än' mā'lĕn'-dĕth väl-dās', Don, Spanish poet: b. Ribera del Fresno, Badajoz, 11 March 1754; d. Montpellier, France, 24 May 1817. He studied law at Salamanca, where he attracted attention by his poems in the old ballad manner and was taken up by the poet Cadalso. In 1780 he received the first prize in a competition under the control of the Spanish Academy for his pastoral 'Batilo,' and, in 1784, his comedy, 'Las Bodas de Camacho,' won a prize from the city of Madrid, although unsuccessful on the stage. In Madrid he won the favor of Jovellanos, who appointed him professor of the classics in the University of Salamanca and urged him to enter upon an unfortunate political career; he became judge in 1789, a judicial chancellor at Valladolid in 1791, and fiscal in the supreme court in Madrid in 1797. He suffered brief exile after the fall of Jovellanos (q.v.) in 1798; but in 1802 returned to Salamanca. His sympathy with France, however, made him more than ever unpopular, and after the expulsion of Joseph Bonaparte, he went into exile in France. He was one of the most prominent figures in Spanish literary life during the 18th century.

Meletius, founder of the sect of Meletians. He was bishop of Lycopolis in the 4th century, and antagonized Peter, patriarch of Alexandria, by refusing absolution and communion to the lapsed, that is, those who under the stress of persecution had renounced their faith. A schism resulted from the dispute and Meletius traveled through Egypt and Syria gathering thousands of followers, until the Council of Nicæa, 325, deprived him of authority and he died soon after, a merely titular bishop. Another Greek ecclesiastic of the same name and century was made bishop of Antioch in 360, when the Arian controversy was at its height.

Melgarejo, Mariano, mä-rē-ä'nō mäl-gä-rā'hō, Bolivian soldier: b. Cochabamba, Bolivia, 18 April 1818; d. Lima, Peru, 23 Nov. 1872. He entered the army at an early age and by his courageous though somewhat unprincipled conduct in the many revolutions in his country, rose to be chief adviser of General Acha in 1862 and was made a general. In 1864 he turned against Acha who was then president, instigated a revolution and seated himself in the presidential chair. During a brief absence of Melgarejo the ex-president Belzu returned and reinstated himself in the presidency only to be shot by Melgarejo himself, who then became dictator. He crushed a revolution in 1866 and in that year formed an alliance with Spain against Peru and Chile. Revolutions followed and he was compelled to flee the country in 1871 and was killed in a quarrel at Lima.

Melicertes, son of Athamas and Ino. In fear of Athamas, whose children by Nephele, Phrixus and Helle, she had tried to kill, Ino jumped into the sea with Melicertes. She became the sea divinity Leucothea, he Palæmon, whom the Romans identified with their god of harbors, Portunus.

Melikoff. See LORIS-MELIKOFF.

Melilite, or Mellilite, a native silicate of sodium, calcium, magnesium, aluminum and iron, whose formula has not yet been satisfactorily determined. Potassium is also commonly present to some extent. Melilite crystallizes in the tetragonal system, and has a vitreous or resinous lustre, and usually a honey-yellow color, from which circumstance it derives its name (Greek, «honey»). It is brittle, translucent (at least in thin layers), and distinctly pleochroic. It has a hardness of about 5, and a specific gravity of 3. The mineral occurs in basic eruptive rocks, and is also observed, quite frequently, in the slag from furnaces. It is sometimes called mellite.

Mel'ilot, a genus of annual, biennial and perennial herbs of the natural order *Leguminosæ*. The species, of which there are about a dozen, are natives of western Asia and the Mediterranean region, and have become widely distributed in temperate and sub-tropical climates. They are upright, alfalfa-like plants with small yellow or white flowers which are borne from late spring until frost. The pods are few-seeded and not twisted as in the closely related genus, *Medicago* (q.v.). The two best known species are yellow melilot (*M. officinalis*), an annual, and white melilot (*M. alba*), a perennial, which are common weeds in waste places, the former especially upon dry, clayey soils, the latter in damp situations. Like other members of the genus they are sweet-scented, particularly while drying, and their flowers are used to some extent for perfumery.

Meline, James Florant, American lawyer and author: b. Sackett's Harbor, N. Y.; d. Brooklyn, N. Y., 14 Aug. 1873. He was graduated at Mount Saint Mary's College, Emmettsburg, Md., and went to Cincinnati, where he was one of the professors at the «Athenæum»; and, while teaching, studied law. He was also one of the editors of the 'Catholic Telegraph.' After spending some time abroad in study and travel, he returned to Cincinnati, was admitted to the bar, and commenced the practice of law; later he relinquished his profession and established a banking business, also holding consulates for France and other nations. In 1860 his business failed, and shortly afterward he enlisted in the Federal army. He served throughout the Civil War under Gen. Pope, attaining the rank of colonel, and after the war was for two years chief of the Bureau of Civil Affairs in the third military district. At the end of that time he went to New York, and devoted himself to literary work, writing for the *Galaxy*, the *Nation*, and the *Catholic World*. In the latter periodical he first published the articles controverting Froude's statements and conclusions in regard to Mary Queen of Scots; these articles, which aroused wide interest, were afterward revised and published in book form under the title 'Mary Queen of Scots and Her Latest English Historian' (1871). He also wrote: 'Two Thousand Miles on Horseback' (1867); 'Commercial Travelling' (1869); and 'Life of Sixtus the Fifth' (1871).

Mélinite, mā'lĭn-īt, an explosive employed by the French government in charging torpedo shells and in the preparation of rupturing charges for the use of the engineer corps and cavalry in effecting demolitions. As originally used it was composed of 70 per cent of picric acid mixed with 30 per cent of pyroxylin dissolved in 45 parts of acetone. As now used, either alone, or with cresylite, it consists exclusively of fused picric acid which is poured into the shell when in the molten condition and is cast there in such a manner as to leave a central canal in the mass in which the fuse, terminating in a mercuric fulminate detonator by which the charged is fired, may be contained. By the use of this fuse the detonation of the charge is delayed sufficiently to allow the shell to penetrate armor and reach the farther side of it before the charge explodes. Mélinite was very thoroughly tested at Bouchet in 1892 to determine the degree of safety that it possesses when exposed to shocks, fire and the accidental rupture of receptacles containing it, and the results were most favorable. Yet there have been several very serious accidental explosions with it which have been attributed to the formation of sensitive picrates through reaction of the charge with foreign bodies in the shell. The explosion of mélinite is not a complete one, since the gaseous product contains considerable quantities of carbon monoxide which is readily combustible. It is also very poisonous. This explosive owes its name to the yellow color which is one of its chief characteristics.

Meliorism. See PROGRESS.

Melis'sa, a plant. See BALM.

Melissus, mē'lĭs-ŭs, Greek philosopher: b. Samos, about 480 B.C. He was the son of Ithagenes, and is said to have been a friend of Heraclitus, and to have commanded the fleet opposed to Pericles in 440 B.C. in the Samian war. Some fragments of a prose work of his, written in the Ionic dialect, have come down, and have been collected and published by Brandis and by Mullach (1846). From these he appears to have been a philosopher of the Eleatic school, and to have reached more definiteness and consistency than Parmenides.

Melita, mĕl'ĭ-tạ, the island on which Saint Paul, on his voyage to Rome, was cast away. This has generally been considered to be the Island of Malta, the ancient name of which was Melita, and one of whose bays has from immemorial time borne the name of St. Paul; but some critics have attempted to prove that it was an island (the modern *Meleda*) on the coast of Dalmatia, in the Adriatic.

Mel'itose. See RAFFINOSE.

Melkart (Phœnician, «God of the City»), name of the presiding deity of the city of Tyre, and of the whole Tyrian nation, namely Baal (q.v.), the sun god. He is sometimes identified with the Heracles or Hercules of the Greeks. He was the patron god of mariners, and the Phœnician colonies of the West, in Africa and Spain were under his protection. To him has been ascribed the subjugation of the savage races who anciently peopled these regions and the building of early Phœnician towns. The institution of order and legislation in these cities was also said to have been his work. Many are the voyages which he is related to have made. One of his exploits was the rescue of Astarte from the darkness in which the moon had imprisoned her in the west; he afterward made her his wife. For an account of the Temples of Melkart at Tyre consult Jeremias, ‘Tyrus bis zur Zeit Nebukadnezzars’ (1891).

Mel'kites. See MELCHITES.

Mell, Patrick Hues, American educator: b. Walthourville, Ga., 19 July 1814; d. Athens, Ga., 26 Jan. 1888. He was educated at Amherst and after teaching for several years was appointed professor of ancient languages at Mercer University in 1842 and was also ordained a Baptist minister in that year. In 1856 he was appointed to the same chair in the University of Georgia, and in 1870 he became vice-chancellor, which post he resigned in 1872. In 1878 he was appointed chancellor, and in 1880 was elected to the chair of metaphysics and ethics, which offices he occupied at his death. He held several pastoral charges and was president of different conventions in addition to his educational work and published: ‘Baptism’ (1852); ‘Parliamentary Practice’ (1868); ‘Church Polity’ (1878).

Mell, Patrick Hues, American scientist: b. Penfield, Ga., 24 May 1850. He was a son of the preceding, was graduated at the University of Georgia in 1871 and was State chemist in 1874–7. In 1878 he was called to the chair of geology and botany at the Alabama Polytechnic Institute and continued in that position until 1902, when he accepted the presidency of the South Carolina Agricultural and Mechanical College. In addition to his work in the universities he was connected in 1884–1902 with the Alabama Weather Bureau and the Agricultural Experiment Station and he invented a system of weather bureau signals which has been adopted by the United States Weather Bureau. He is a member of various historical and scientific societies and has published: ‘Southern Soapstones and Fireclays’ (1882); ‘Study of Cotton Plant’ (1890); ‘Life of Patrick Hues Mell, Sr.’ (1895); ‘Biological Laboratory Methods’ (1902); etc.

Mellen, mĕl'ĕn, **Grenville,** American poet: b. Biddeford, Maine, 19 June 1799; d. New York 5 Sept. 1841. The eldest son of an eminent chief justice of Maine, he was graduated at Harvard College in 1818, studied law with his father in Portland, was admitted to the bar, and in 1823 he engaged in the practice of his profession. In 1829 he collected from his prose contributions to periodicals a volume entitled ‘Glad Tales and Sad Tales.’ His principal collection of poems, entitled ‘The Martyr's Triumph, Buried Valley, and Other Poems,’ was published in 1833. The ‘Martyr's Triumph’ is in the Spenserian stanza, and is founded on the history of St. Alban; the ‘Buried Valley’ describes the avalanche near the notch in the White Mountains by which the Willey family was destroyed. His verse is pleasing, but in general shows promise rather than performance.

Mel'lilite. See MELILITE.

Mellit'ic Acid, Mellic Acid, or **Benzene Hexa-carboxylic Acid,** an organic acid having the formula $C_{12}H_6O_{12}$, or $C_6(COOH)_6$. It may be prepared by oxidizing charcoal with potassium permanganate, $KMnO_4$; but it is best obtained from its aluminum salt, which occurs native as the mineral melilite (q.v.). The pulverized melilite is boiled with ammonium carbonate, ammonia is added to throw down the aluminum, and the filtrate is evaporated until the ammonium salt of the acid separates out. This is re-dissolved, precipitated by lead acetate, and the precipitated mellate of lead is decomposed with sulphuretted hydrogen gas, which liberates the acid in the free state. Mellitic acid is readily soluble in alcohol and in water, and from its alcoholic solution it crystallizes in the form of silky needles. Heat decomposes it, with liberation of carbon dioxid, and the formation of a new substance, $C_{10}H_6O_8$, known as «pyro-mellitic acid.» Numerous salts of mellitic acid (known as «mellates») have been prepared, but neither the acid nor its compounds are of any special industrial or scientific importance.

Mello, Custodio José de, koos-tō'dē-ō hō-sā' dā mā'lō, Brazilian admiral: b. about 1845; d. 16 March 1902. In 1889 he took a prominent part in the revolution, was promoted to be admiral, and was appointed minister of the navy. Four years later he formed a plot in behalf of the Federal party and the navy, against the party of the army and its candidate for re-election, President Peixoto; bombarded and blockaded Rio de Janeiro; and, when forced out of the harbor by vessels of foreign navies, notably American, occupied Rio Grande do Sul. He could not agree with his lieutenant, Saraiva, however, and so surrendered to the government of Argentina. In 1901 he was accused, in spite of his former republicanism, of plotting to establish an empire, and was interned upon the island of Cobras.

Melloni, Macedonio, mä-chā-dō'nē-ō mĕl-lō'nē, Italian physicist: b. Parma 11 April 1798; d. Portici, near Naples, 11 Aug. 1854. He first became professor of natural philosophy at the University of Parma, where between 1824 and 1831 he taught hygrometry. Political events having compelled him in the latter year to expatriate himself, he went to Geneva, where he made several important discoveries respecting the radiation of heat, which he presented in 1833 to the French Academy of Sciences. Later discoveries won him the Rumford medal from the Royal Society of London. Through the influence of his friends Arago and Humboldt, he was enabled to return to Italy, and was appointed by the king of Naples director of the meteorological observatory on Mount Vesuvius. Among the results of his labors at this institution was the discovery of heat in lunar light, which led to the determination of the analogy of radiant heat to light. Political troubles again interrupted his labors, and for his presumed sympathy with liberal principles he was in 1849 ejected from his post. In 1850 he published the first volume of a work entitled 'La termocrasi, o la colorazione calorifica,' containing an account of his theory of the "coloration of light," and of his experiments on the diffusion of heat by radiation, and particularly of its transmission through transparent media. Subsequently he gave much attention to the study of electricity, and combated the conclusions of Faraday with regard to the transmission of currents over submarine wires.

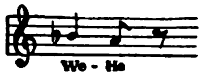
Melocac'tus, a cactus typical of the tropical American melon-cactus family, *Melocactidæ*. It consists of a globose or conical stem, having rows of spines at intervals and flowers at the top on a hemispherical or cylindrical head. *M. communis* of the West Indies is the Turk's, Englishman's, or Pope's-head cactus. The head bearing the flower is red, and like a Turkish fez in form.

Melo'deon, a musical wind instrument with a row of reeds and operated by keys. The rocking melodeon, known in American since about 1825, was unsightly, tardy in sounding, and of harsh tone. Jeremiah Carhart in 1815 conceived the plan of acting on the reeds by suction instead of blowing, and reversed, to this end, the bellows and reeds, inventing the present instrument in 1836. He thus secured prompt sounding, and a flute-like quality of tone; "voiced" the note by curving the reeds; and made many other improvements. In a single year 22,000 of these instruments have been manufactured in the United States, although there is no longer any great demand for them.

Melodra'ma (from the Greek *melos,* song, and *drama,* action), originally and properly a half-musical drama, or that species of drama in which the declamation of certain passages is interrupted by music. It is usually a tragedy of common life, filled with surprises, acts of violence, and all that excites and sustains the attention of the audience, mixed up with dancing and music, and sometimes with scenes of a rudely comic character. Probability is freely sacrificed for the sake of striking situations. See Drama, The.

Melody, in music, a succession of single tones so arranged as to express a musical thought. A solo for one instrument or voice with or without accompaniment is the most typical example of a melody. A curious exception exists in a song with piano accompaniment by Peter Cornelius called 'Ein Ton' (Monotone) in which the voice part consists throughout of but one note repeated many times. Here the slight suggestion of melody that exists is entirely in the accompaniment.

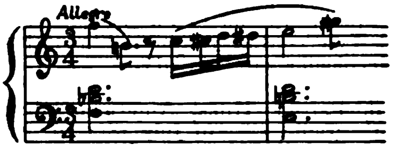
Melody is one of the most comprehensive terms used in music, being properly applicable to as few as two notes or to as many as the entire principal vocal or instrumental part of a composition. An example of the first is the motif of woe in Wagner's 'Der Ring des Nibelungs.'



Examples of the latter are too numerous to require mention.

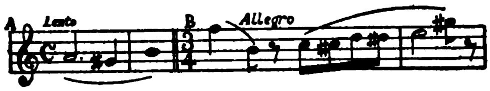
The term is also appropriately applied to a phrase or portion of a phrase in a part that has been subordinate to the principal one and which for a moment gains importance on account of its greater melodic significance. In concerted music, vocal or instrumental the highest part is usually the melody, though as stated above an inner one may temporarily assume it. In polyphonic music all the parts are equally melodic.

Melody is the outgrowth of the improvised recitatif. The early Greek singer standing before his audiences holding his four-stringed lyre or chelys, χέλυς, plucked a string and recited his poem on that note until fancy impelled him to change it. From this crude ancestor has sprung melody as we understand it to-day, which with rhythm and harmony form the great trinity necessary for the complete expression of music. Melody is the only one of the three capable of suggesting enough of the other two to be satisfactory by itself. The folk-song of old and the popular song of to-day may be sung by a single voice without any accompaniment and yet convey a very definite idea of the rhythm and something of the harmony that would naturally accompany the tune. Such a performance is, of course, incomplete and only effective in music of the simplest character. Yet it conveys much more than the mere rhythm of the tune played on a drum would give and still more than the mere harmony played without either the melody or the rhythm. It is curious that the Greeks with all their extraordinary achievements in all other forms of art should have advanced so little in music. No doubt they used music in their religious feasts and the cross flutes πλαγιαυλος and lyres supplied what they must have thought melody, but they do not seem to have ever dreamed of musical accent or rhythm, without which we cannot to-day call a succession of sounds melody, while harmony was unthought of for many centuries.

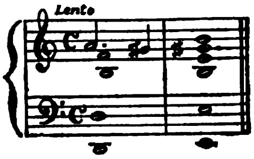


" Also sprach Zarathustra "— Richard Strauss.

Melody is greatly affected by the harmony that the composer has wedded to it, and it is to this fact perhaps more than any other that originality continues possible, for with but twelve different notes from which to form a melody it is evident that even with all the variations that rhythm can add the melodic material is capable of exhaustion in the enormous and growing number of compositions. The following phrases of melody, especially the first, have no particular suggestion played alone:



but with the harmony that the composers have added they have an entirely different significance, the one of great solemnity and foreboding, the other of harsh cynicism and sneering.



Motif of Fate
"Die Walkuere"—Wagner.

Henry Gordon Thunder,
Conductor Choral Society of Philadelphia.

Melo'idæ. See Blister-beetle.

Melon-cactus, or **Melon-thistle.** See Melocactus.

Melon-pear, or Shrub. See Melons.

Melons, a popular name for several unrelated plants, but more particularly for two members of the order *Cucurbitaceæ,* the muskmelon (*Cucumis melo*) and the watermelon (*Citrullus vulgaris*). The more important other fruits similarly known are the Chinese preserving melon (*Benincasa cerifera*) of the same order; the melon papaw (*Carica papaya*) of the order *Passifloraceæ;* and the melon-shrub or melon-pear (*Solanum muricatum*) of the natural order *Solanaceæ.*

The muskmelon is an annual trailing herb which has been introduced by man into all tropical, sub-tropical and many temperate climates from southern Asia where it is native. It is characterized by long, running, hairy and somewhat prickly vines, roundish heart-shaped leaves, yellow monœcious flowers, and usually edible fruits of very various forms and sizes. The following are the principal botanical varieties or sub-species: Variety *cantaloupensis,* the cantaloupes, or rockmelons, which have hard, warty, or scaly rinds more or less furrowed, and flesh of various colors from white to red, green or yellow. In the United States the name "cantaloupe" is loosely applied to horticultural varieties of other groups. Variety *reticulatus* includes the nutmeg or netted melons which have softer rinds, sometimes smooth but usually more or less netted. To this group belong the larger part of the so-called cantaloupes in American markets. Variety *saccharinus* comprises the pineapple-melons which have very sweet flesh but are not clearly distinct from the preceding group. Variety *inodorus,* the winter muskmelons, which have less hairy, lighter-colored vines and foliage, and whose long-keeping fruits are deficient or entirely lack the characteristic musk-melon odor. This group is less cultivated in the United States than in the Mediterranean region; but because the fruits can be kept until Christmas or later when properly grown, gathered before frost, and slowly ripened in a cool, rather dry room, they should become more widely popular where the seasons are long enough to permit their reaching such a stage of maturity. Variety *flexuosus,* the snake-melons or cucumbers, have very long, narrow, greenish, contorted fruits, prized more as oddities than for economic uses, though often used for making preserves. They are distinct from the snake-gourds which belong to the genus *Lagenaria.* A variety *chito,* called orange-melon, melon-apple, garden-lemon and many other popular names, bears orange- or lemon-like almost scentless fruits with white or pale yellow flesh, which is grown to some extent for preserving. Variety *dudaim,* the pomegranate-melon, Queen Anne's pocket-melon, dudaim melon, etc., has small brown and yellow fruits valued solely for their exquisite perfume.

Melons are propagated wholly by means of seeds, which may be sown directly in the field or started under glass upon inverted sods, in flower-pots, berry-boxes, etc., and transplanted to the field as soon as danger of frost has passed. The former method is practised most extensively in the South, and in other warm climates where the seasons are long; the latter in the North because the shortness of the season demands that the plants obtain an early start. The soil best suited to melons is a light sandy loam well drained, well exposed to the sun and well supplied with plant-food. It should be deeply plowed, thoroughly harrowed and kept clean of weeds, especially before the plants are set and until the vines cover the ground. After harrowing, the ground is marked in checks about five feet square, and ten or twelve seeds, or five or six plants, are set in each "hill," from which all but the two or three strongest vines are removed after the insects have had their share. Often, especially upon rather poor or tenacious soils, two or three shovelfuls of well rotted manure is mixed with the earth of the hills to give the plants a little impetus. The fruits are gathered when they will readily separate from the stems, preferably in the early morning.

During the closing decade of the 19th century the demand for highly flavored melons was greatly increased by the appearance in the eastern markets of the Rockyford melon, a small fruit grown in Colorado. Its appearance in large quantities drew public attention to numerous other high flavored melons grown in other sections. As a consequence, many inferior varieties have nearly disappeared from cultivation. With the exception of the Colorado melon fields there is no extensive exporting region in the United States devoted to this crop, the crop of each Southern State being mainly consumed in local markets. New Jersey, Maryland and Delaware produce immense quantities, the first-mentioned State especially; and the product is consumed largely in the cities of Pennsylvania and New York. The Mississippi Valley States also send considerable quantities to northern markets.

The watermelon is an annual trailing herb, a native of tropical and southern Africa, whence it has been introduced by man into all tropical, sub-tropical and many temperate climates for its watery sweet fruits, which sometimes weigh more than 75 pounds, but usually range between 20 and 50 pounds. The vines are more hairy, lighter green, longer running than those of the muskmelon and the leaves are deeply notched, in some cases approaching the compound form. Except for a horticultural group of firm-fleshed varieties known as preserving watermelons or more popularly as citrons, the watermelon seems to have no varieties worthy the name of subspecies or botanical varieties, and even this group appears not to have received such designation.

In general, the watermelon requires the same treatment as the muskmelon, the soil being, if anything, lighter and more sandy, and the distances between hills about double, except for the smaller growing sorts. The principal producing regions are Georgia and Colorado, but the watermelon is grown largely in all the Southern States, and some of the short-season varieties as far north as Michigan and Ontario. The watermelon has much better shipping qualities than the muskmelon, since the tough-rinded kinds may be placed in cars two or more feet deep, the smaller specimens upon the bottom, and shipped long distances. Muskmelons, being more delicate, must be barreled or crated. The fruits are used exclusively in the raw state, and have no by-products such as vinegar, sugar, syrup or brandy. The rinds, however, when deprived of the hard exterior, are often preserved with raisins, etc.

Both muskmelons and watermelons are subject to the attacks of several insects, among which the small, black, striped cucumber-beetle (*Diabrotica vittata*), the squash vine-borer (*Mellitia ceto*), the melon-caterpillar (*Margaronia hyalinata*), the cucumber flea-beetle (*Crepidodera cucumeris*), the squash-bug (*Anasa tristis*), and the melon-louse (*Aphis gossipii*) are the most important. Tobacco dust and plant protectors are largely used to prevent the attacks of the first, the adults of which feed upon the under sides of the leaves and the larvæ upon the roots. The melon-louse is fought with kerosene emulsion sprayed upon the under sides of the leaves, or by fumigation with carbon disulphide. No effective remedy has been suggested for the borer. Arsenical sprays have been recommended for the caterpillars and other chewing insects. Since the insects are believed to spread diseases from plant to plant, melon-growers seek to prevent insect injury as far as possible and practicable. The diseases, of which a large number have been described, are much the same as attack cucumbers, and may be similarly controlled where control has been found possible. Some diseases, as wilt, have defied all tried remedies. This disease generally ruins the vines a week or ten days before the fruits would be ready to harvest. Many of the complaints as to the poor quality of eastern-grown muskmelons result from the sale of melons that have been gathered from blighted fields.

Consult: Bailey, ‘Cyclopedia of American Horticulture,’ New York, 1900–2.

M. G. Kains,
Crop Expert.

Mel″opian′o, an invention by which sustained sounds can be produced on a pianoforte. It consists of a series of small hammers set into very rapid vibration by the winding up of a spring. See Musical Instruments, Mechanical.

Melos, mē′lŏs, **Milo**, or **Milos**, Greece, an island in the Ægean Sea, the westernmost of the Cyclades, about 65 miles east of the Morea. Its length, east to west, is about 14 miles, and it is about eight miles in extreme breadth; area, 64 square miles. It is mountainous, of volcanic formation, has hot mineral springs, and mines of sulphur. The island was once famous for its riches, fertility, and population, and corn, wine, cotton, oranges, and other fruits are still grown. Sulphur, manganese ore, millstone, gypsum, etc., are exported. Kastron is a large village on the north coast. The island of Melos was first colonized by Phœnicians, and afterward by Dorians. During the Peloponnesian war it was the faithful ally of Sparta till 416 B.C., when it was taken by the Athenians and its inhabitants massacred or sold as slaves. From 1204 till 1537 it formed part of the Venetian duchy of the archipelago. At the latter date it was taken by the Turks, with whom it remained till the epoch of Greek independence. In 1820 a peasant discovered here the celebrated statue known as the Venus of Milo, now placed in the Louvre at Paris; the Poseidon in the National Museum at Athens was also discovered here. There are numerous interesting archæological remains, chief of which are those of the Hall of the Mystœ on the site of the ancient capital near the village of Klima, and those of prehistoric Phylakopi, which were excavated by the British School at Athens from 1896 to 1899.

Melpomene, mĕl-pŏm′e-nē, one of the Muses, daughter of Zeus and Mnemosyne. She presided over tragedy, and was generally represented as a young woman with vine leaves surrounding her head, and a tragic mask covering her face.

Mel′rose, Mass., city, in Middlesex County; on the Boston & Maine railroad; about eight miles north of Boston. It was settled about 1632, and until 1649 it was a part of Charlestown. It remained a part of Malden until the next year (1650), when it became a separate municipality. It was chartered as a city in 1900 and includes the villages of Fells, Wyoming, and Melrose Highlands. It is a residential suburb of Boston, but has considerable manufacturing. The chief manufactures are rubber boots and shoes. The State Reservation, Middlesex Fells, 1,800 acres, and Spot Pond, a natural reservoir, are attractive features. The government is vested in a mayor, elected annually, and a council. The subordinate officials are chosen by the mayor and council; the school board by election. Pop. (1890) 8,519; (1900) 12,962; (1910) 15,715. Consult: Drake, ‘History of Middlesex County.’

Melrose, Scotland, a village of Roxburgshire, on the Tweed at the base of the Eildon Hills, three miles north of Abbotsford, the home of Sir Walter Scott, whose ‘Lay of the Last Minstrel’ gave Melrose and its ruined abbey world-wide celebrity. The village has a population of nearly 2,500. The famous abbey, now the property of the Buccleuch family, is admitted to be the most beautiful of all the ecclesiastical ruins in Scotland. The architecture is in the late flamboyant Gothic style, and the chief remains are part of the nave, the transept, choir, and the southern aisle with several chapels, of the abbey church, and fragments of the cloister. The church originally was 258 feet long, with a width at the transepts of 137 feet. It was founded by King David I. in 1136; destroyed by Edward II. in 1322, and rebuilt by Bruce in

1326. It was partly demolished by the English in 1545.

Melting Point, the temperature at which the solid and liquid states of a body can coexist, without the fluid part of the mixture solidifying, nor the solid part melting. The melting point of a body which is crystalline in nature (like ice) is usually quite definite, and a body of this kind, when it melts, passes at once from a state of perfect solidity into a state of perfect fluidity. The melting point of an amorphous body, such as wax or pitch, is often very indefinite; and when a solid of this sort is gradually heated it grows soft and passes into the fluid state by a process which is practically (or even absolutely) continuous. The phenomena of the fusion and solidification of amorphous bodies like wax are not yet understood as well as those that attend the change of state of a crystalline body; and it is to be understood that what follows in the present article is stated with particular reference to the crystalline class of substances, in which the melting point is definite.

In general, solid bodies expand upon melting, the original solid having a greater density than the liquid that results from its fusion. In the case of water, as is well known, the reverse is true; the fact that ice floats in water proving that the water is denser. The fact that the density of a substance changes upon fusion implies (as may be proved by the mechanical theory of heat) that the melting point of the substance cannot be entirely independent of the pressure. This fact was first discovered in 1849 by James Thomson, who showed that the melting point of a substance like ice, which contracts upon melting, must be lowered by pressure; while the melting point of one which expands upon melting must be raised by pressure. These theoretical conclusions have since been abundantly verified by experiment. In the case of ice, for example, it has been found, by Dewar, that the melting point is lowered by 0.0130° F. per atmosphere of increase of pressure, up to 700 atmospheres.

When a substance passes from the solid to the liquid state, it absorbs a very considerable amount of heat, which is known as the «latent heat of liquefaction»; and the liquid which is formed cannot be all reduced to the solid state again until an exactly equal quantity of heat has been abstracted from it. When heat is added to a mixture composed of a solid and its liquid (pounded ice and water, for example), it does not increase the temperature of the mixture, but merely causes a certain amount of the solid to melt. This continues so long as any of the unmelted solid remains; each addition of heat merely bringing about a corresponding amount of liquefaction, while the temperature of the mixture remains unchanged. It is only after all of the solid has melted that the further addition of heat will produce elevation of temperature. The melting points of compounds undoubtedly depend, in some manner, upon their molecular constitutions, but we have, as yet, no definite knowledge of the nature of the dependence. We know that in a homologous series of organic compounds, the melting points show a strong tendency to increase, as the molecular weights of the members of the series increase; but the change in the melting points is irregular as we proceed from member to member, and no law has yet been discovered which takes the changes fully into account. The melting point of a mixture (such as an alloy) is often lower than that of any one of the constituents, and the effect of the presence of an impurity in a given substance upon the melting point of that substance is often out of all apparent proportion to the quantity of impurity present. This fact implies that in the determination of a melting point it is highly important that the substance under examination shall be as nearly pure as possible. The presence of slight, unrecognized, and apparently negligible impurities has sometimes led to entirely erroneous conclusions. In 1860, for example, Kolbe announced the discovery of an acid isomeric with benzoic acid, but having a lower melting point; but Beilstein afterward proved that the substance in question was merely ordinary benzoic acid contaminated with a quantity of chlorobenzoic acid so small as to be barely recognizable by analysis.

For determining the melting point of minerals, the instrument devised by Joly, and known as the meldometer, is sometimes very convenient. It consists essentially of a strip of platinum foil, upon which small fragments of the mineral are laid. The platinum is then gradually heated by the passage of an electric current, until the mineral melts; the temperature of the foil being obtained by a calculation based upon the resistance of the platinum, the observed strength of the current, and the rate at which heat is radiated from the foil, as determined by separate observations. This method is especially useful for minerals which can be had only in small fragments.

Mel'ton Mowbray, mō'brĕ, England, an ancient market town in Leicestershire, 14 miles northeast of Leicester, on the right bank of the Wreak, at the junction of the Eye. Melton Mowbray is famous for its pork-pies, five tons a week being exported, and is also celebrated for Stilton cheese. Melton Mowbray, however, owes its prosperity chiefly to being the seat of the Melton Hunt, which attracts the sporting world in great numbers during the winter months, extensive and luxurious hunting establishments being maintained here.

Melt'zer, Charles Henry, American playwright and journalist: b. London, England, 7 June 1853. He was educated in Paris, where he became correspondent of the Chicago *Tribune* and later of the New York *Herald*, for which paper he traveled over Europe and Egypt. In 1888 he was appointed dramatic critic of the New York *Herald*, holding that position for four seasons. From 1893 to 1896 he was dramatic reviewer of the New York *World*. His experience was utilized as literary associate in connection with a course of modern plays at Carnegie Lyceum, New York, and in Washington, Boston, and elsewhere. Among his plays are: 'The Story of Rodion the Student,' and English versions of 'Hannele' (Hauptmann), 'Mme. Sans Gêne' (Sardou and Moreau), 'L'Arlesienne' (Daudet), 'The Sunken Bell' (Hauptmann); and a farce, 'His Honor the Mayor' (with A. E. Lancaster).

Melusina, mĕl-oo-sī'nạ, in French superstition, a beautiful nymph or fairy, who is represented as the daughter of Helmas, king of Albania, and the fairy Persine; and as having married Raymond, Count of Toulouse, who built the magnificent castle of Lusignan. Like most of the fairies of that period, she was doomed to a periodical metamorphosis, during which the lower part of her body assumed the form of a fish or serpent. On these occasions she exerted all her ingenuity to escape observation; but having been once accidentally seen by her husband in this condition, she swooned away, and soon afterward disappeared. Her form is said to be seen from time to time on the tower of Lusignan, clad in mourning and uttering deep lamentations. Her appearance was believed to indicate an impending calamity to the royal family.

Melville, mĕl'vĭl, or **Melvill, Andrew,** Scottish reformer: b. Baldovie, near Montrose, Forfarshire, 1 Aug. 1545; d. 1622. He was educated at the grammar school of Montrose and the University of Saint Andrews; studied two years (1564-6) at the University of Paris; went to Poitiers to pursue his studies in the law; there became regent in the College of Saint Marceon; and through the influence of Beza received an appointment to the chair of humanity in the academy of Geneva. Returning to Scotland in 1574, he was at once appointed principal of the University of Glasgow, and in 1580 was made principal of Saint Mary's College, Saint Andrews. In 1582 he presented a petition to King James against the undue interference of the court in ecclesiastical affairs, for which he escaped imprisonment by going into England. Returning in 1585, he resumed his duties at St. Andrews, and was moderator of the General Assembly in 1587, 1589, 1594. In 1606 he was summoned to London by the king to confer on church matters, but because of his outspokenness he was committed to the Tower, and there remained until 1611. He was then released upon the solicitation of the Duke of Bouillon, retired to France, and became professor in the university at Sedan, which, according to some accounts (others say London), was the place of his death. Consult 'Lives' by McCrie (1819); Morrison (1900).

Melville, Sir **George,** British administrator: b. Aberdeen, Scotland, 1 July 1842. He was educated by private tutors and at Edinburgh Academy. By competitive examination he entered the imperial service in 1862; was transferred to the colonial civil service in 1874, and appointed treasurer of Sierra Leone, the next year acting also as colonial secretary of that colony. In 1879 he was made assistant government secretary of British Guiana; in 1899 was appointed colonial secretary of British Honduras, and during the next two years administered the government for which he was decorated. The government of the Falkland Islands was administered by him in 1893, that of the Bahamas in 1894-5, and that of the Leeward Islands from 1895 to 1901.

Melville, George Wallace, American naval engineer: b. New York 10 Jan. 1841; d. 17 March 1912. Educated Brooklyn Polytechnic; Entered the navy as assistant engineer 1861; served through the War; and in 1879 accompanied the De Long expedition on the Jeannette to discover the northeast passage. Of this party he was one of the few survivors; most of the others owed their lives to his indomitable courage and herculean strength — he carried a brother officer, weighing 175 pounds, upon his back, through ice and snow, at the same time superintending all movements of the crew and on occasion helping with the boat. He also commanded the subsequent search expeditions which recovered the Jeannette's records and De Long's body. In 1887 he was made chief engineer of the navy, a post from which he retired in August 1903, having entirely reformed the service, put navy engineers on a professional rather than an artisan footing, introduced the triple screw on such successful ships as the Columbia and Minneapolis, saved the department a tremendous sum by his refusal to adopt a boiler which had proved unsatisfactory in the British navy, and designed 120 ships of over 700,000 horse-power. Melville was made rear-admiral in 1899. His book, 'In the Lena Delta' (1885), describes his experiences in the Jeannette expedition.

Melville, Herman, American naval novelist: b. New York 1 Aug. 1819; d. there 28 Sept. 1891. His grandfather was the original of Holmes' 'Last Leaf.' His father, an importing merchant, died when Herman was a boy, and in 1837 his education in the Albany Classical School and in New York city having been completed, he shipped as a cabin boy. Then he taught school for several years, but in 1841 sailed on a New Bedford whaler, from which in 1842 he made his escape with a comrade on one of the Marquesas. His experiences among the warlike natives and his rescue by an Australian whaler are described in 'Typee, a Peep at Polynesian Life' (1846), a great success and an excellent portrayal of life in the South Seas. In 1847 he married the daughter of Justice Lemuel Shaw of Massachusetts; from 1850 to 1863 lived in Pittsfield; was employed in the New York custom-house from 1866 to 1885; and then retired because of ill-health. Melville's writings apart from a few small volumes of verse are mostly taken up with the life of the sailor; some of his better known titles are: 'Omoo, Adventures in the South Seas' (1847); 'White Jacket, or the World in a Man-of-War' (1850), which effected the abolition of flogging in the United States navy; 'Moby Dick, or the White Whale' (1851); and 'Pierre, or the Ambiguities' (1852). These stories were justly popular and are highly praised by W. Clark Russell (q.v.). Several "philosophical romances" met with little success. 'Battle Pieces, and Aspects of the War' (1866) is Melville's best verse. His four best romances of the sea were re-edited in 1892.

Melville Island, (1) an island of the Arctic regions crossed by lat. 75° N., lon. 110° W., and separated on the west by Fitzwilliam Strait from Prince Patrick Island. Its greatest length is 200 miles; greatest breadth 130 miles. It was discovered in 1819 by Parry, who gave the island its name and wintered there; (2) an island at the entrance to Van Diemen Gulf, off the shore of the north territory of South Australia, with an area of abut 1,800 square miles. It is hilly and densely wooded, especially with several species of eucalyptus. The earliest British settlement was made in 1824.

Melville Peninsula, North America, a northeastern projection of Keewatin, bounded on the north by Fury and Hecla Strait and on the east by Fox Channel. It is about 250 miles long by about 100 miles broad.

Melville Sound, North America, a channel about 250 miles long by 200 miles broad, extending southeast of Melville Island, and communicating with the Arctic Ocean on the west by Banks' Strait, and with Baffin Bay on the east by Barrow Strait and Lancaster Sound.

Mem'brane, in anatomy and physiology, a thin sheet-like tissue, more or less elastic, varying in structure and vital properties. Membranes absorb or secrete fluids, connect certain parts of the body, separate, envelop, or form certain organs, or act as partitions between two fluids or gases, permitting them to mingle. Mucous membranes line the canals, cavities, and hollow organs which communicate externally by different apertures on the skin; for example, the digestive, respiratory, and genito-urinary tracts. These membranes are soft and velvety, and have on their free surface cells for absorption or motion, and in their substance follicles which secrete mucus for lubricating purposes. Serous membranes, such as the peritoneum, pleura, and pericardium, facilitate the motion of the organs they envelop (abdominal digestive organs, the lungs and heart) by reason of the serum they secrete, and also maintain the shape of these organs. Allied to the serous membranes are the synovial membranes lining movable joints. By reason of their smoothness and by the aid of their lubricating serum the ends of bones move readily upon one another. Fibrous membranes (for example, periosteum, dura mater, and perimysium), not moistened by any particular fluid, augment the solidity of organs they envelop, retain them in position, favor their motion, and form canals and rings for the passage of different organs.

Membré, mŏṅ-brā, **Zenobius,** French missionary in America: b. Bapaume, France, 1645; d. Fort St. Louis, Texas, 1687. He became a member of the Récollet Order; was sent as a missionary to Canada in 1675; accompanied La Salle in his western expedition; was with Tonti at Crèvecœur, where he helped bring about peace between the Iroquois and the Illinois; in 1682 went down the Mississippi with LaSalle; and in the same year returned to France. For a time he was warden of a convent in his birthplace. But in 1684 he set out again with La Salle for the mouth of the Mississippi. He was left by LaSalle at Fort St. Louis and there massacred by the Indians. He wrote a description of his trip down the Mississippi, which was incorporated by his cousin Christian le Clerq into his 'Etablissement de la Foi dans la Nouvelle France' (1691), and which was later unscrupulously copied by Hennepin (q.v.). This narrative has sometimes been attributed to LaSalle.

Memel, mā'mĕl, Germany, an important fortified seaport of Prussia, near the Russian frontier, at the north extremity of the Kurisches Haff, at its opening into the Baltic, 70 miles northeast of Dantzic. It was almost wholly destroyed by fire in 1854, and was rebuilt in modern style. It has a large harbor, and exports from Lithuania and Russia timber, flax and linseed, coal, manure, grain, and herrings; has also manufactures of brandy, soap and chemicals, sawmills, iron foundries, breweries, and ship-building yards. Memel was founded in 1252 by the Livonian order, who gave it to the Teutonic Knights, by whom it was fortified in 1404. It suffered severely in the Lithuanian wars (13th to 15th centuries). Here in 1807 Frederick William III. of Prussia took refuge, and a treaty with England was signed.

Mem'ling, or Memlinc, Hans, Flemish painter: b. Mainz 1430; d. Bruges 1495. He settled at Bruges 1478, of which town he was a prosperous citizen until his death. While all that is handed down of his biography is apocryphal, it is evident, from his works, that he was an imitator of Roger Van der Weyden, although he avoided the harshness and ungraceful drawing of that artist's style. He stood alone among the Flemish painters of his day in the religious tenderness of his pictures, their life-like expression, their exquisite coloring and modeling. His chief works are to be found in St. John's hospital, Bruges, namely, the altarpiece 'Marriage of St. Catharine' (1479); 'Portrait of Maria Moreel as Sybilla Persica' (1480); and the 14 scenes illustrating the legend of St. Ursula and the 11,000 Virgins of Cologne (1589). In the Academy of Bruges is a triptych of his in the central panel of which are Saints Christopher, Maurus and Ægidius, and on the wings, Burgomaster Moreel (who offered the picture) with his family. In the Royal Gallery at Turin is his 'Seven Dolors of Mary' — a passion picture; in the Pinakothek at Munich a companion picture, 'The Seven Joys of Mary.' Consult, Michiels, 'Memlinc, sa Vie et ses Œuvrages' (1883); Wauters, 'Sept Etudes pour Servir à l'Histoire de Hans Memlinc' (1894).

Memmi, mĕm'mē, **Simone.** See MARTINI, SIMONE.

Memminger, mĕm'mĭn-jėr, **Christopher Gustavus,** American politician, secretary of treasury in the Confederate government: b. Würtemberg, Germany, 17 Jan. 1803; d. 7 March 1888. He was brought to America in infancy, and was educated at South Carolina College. He studied law; began to practise in Charleston in 1825; entered politics as a leader of the Union party, attacked the States' Rights party in a satire called 'The Book of Nullification' (1832); reformed the public school system of the State; and for 20 years was in the State legislature, much of the time acting as head of the finance committee. In 1859, after John Brown's raid, he was commissioned by South Carolina to consult with other delegates in Virginia as to the best method of warding off attacks of Abolitionists. From the formation of the Confederacy until June 1864 he was secretary of treasury; and his mistaken policy in that office did much to ruin the Confederacy financially.

Mem'non, in Greek mythology, the son of Eos (Dawn), an Ethiopian prince, nephew of Priam, for whom he fought at Troy. After he had killed Antilochus he was defeated by Achilles. The post-Homeric legend adds that his mother wept bitterly for him, even after he had been made immortal. Memnon's kingdom was localized on the west bank of the Nile, and one of the colossal statues of Amenhotep III. as early as the 1st century A.D. became connected with the myth. It was said to portray Memnon, and the musical note emitted when the sun's rays struck the statue in the early morning (probably due to the action of sudden heat on the chilled damp stone) were explained as Memnon's greeting to his mother. The statue, rehabilitated by Severus, is no longer sonorous. The name Memnonium was applied in the Ptolemaic period to only to the west bank of the Nile, as «Memnon's land,» but to a temple near Abydus, excavated by Mariette in 1859, which contains the famous «gallery of kings.» This has a list of 76 Egyptian kings, and dates from the time of Seti I. and his son Rameses II. This Memnonium contains many other important sculptured documents.

Memnon'ium. See MEMNON.

Memorial Arch, an arch usually built across an avenue or street, or at an entrance to a park, garden or other public place, to commemorate some person or event. The Washington Arch in Washington Square, New York city, is a well-known American example of the memorial arch. It is built of marble and is adorned with elaborately carved figures.

Memorial Day. See DECORATION DAY.

Memory and its Disorders. Locke has defined memory as «the power the mind has to revive perceptions which it once had, with the additional perception that it has had them before.» Ribot summarizes three ideas as constituting memory: (1) the preservation of certain states; (2) their reproduction; and (3) their recognition; and apart from metaphysical quibbles and niceties this is the common-sense view of memory. The Hamiltonian distinctions between recollection and memory are of little practical import; but the differences between memory and imagination are fundamental. Certain memories may be said to be subconscious, so that the third part of Ribot's definition and the additional perception of Locke may need a certain degree of extension. It is now clearly recognized that the collections of gray matter in the cerebrospinal axis below the cortex may be capable of storing impressions, and it is even thought by many that all parts of the sensory nervous system may be said to be concerned in mind-action and in memory. It is largely a question of terminology whether or not consciousness of previous experience should determine what we call memory. If so, then so-called subconscious memories need another term, and the whole subject-matter of memory in hypnotic and allied states is in need of thorough overhauling. From a purely mechanical point of view memory is interpretable as a result of a biochemical phenomenon. The sensory nerve-cells, being acted on by certain stimuli, whether of touch, taste, hearing, or sight, undergo certain molecular changes. Repetition of similar impulses induces similar reactions and a habitual response in the affected cells results. A line of least resistance is established, and in these habitual responses the germ of the idea of memory is to be found. From this point of view the nerve-cells retain something as a result of a previous experience, and the repetition of the stimulus finds the cells in a receptive state. Continued repetition of the stimuli constitutes a memory, and in this sense the training of a certain mechanism has bound up in it this mechanical theory of memory. Thus a muscular effort, as in tennis, or skating, or piano-playing, becomes by repetition remembered in automatic action, it may be without consciousness. It very frequently happens, in fact it is the usual rule, that many muscular acts which in their acquisition have called for conscious memories soon become automatic, and the effort no longer rises into consciousness, perhaps because of its diminished intensity. A similar point of view may be held for sound-impressions, for taste, for touch, for sight, in each individual case a different series of nerve-cells and nerve-fibres being involved. Thus the memory for a poem may mean a habit-response to a series of sight or sound impressions, or of the muscular memories of the speech mechanism that has learned to repeat the phrases. The actor who automatically says his lines, often not conscious of what he is saying, the pianist who mechanically plays, or the golfer who unconsciously drives true, all show the same class of memory adaptations, involving different nervous chains.

Memory, however, does not depend on repetition of stimulus alone. There are variations in intensity and duration of stimuli, modifications in plasticity of the nerve-cells themselves, the quality of attention, and above all the native individual character of health of the nerve-tissue itself — all of which factors enter into the everyday variations in memory that are familiar to all. The fixity and enduring quality of the memories of childhood are proverbial, and are due to the great plasticity of the youthful nerve-cells, as well as to the intensity of the early pictures. That one person should have a good visual memory and a poor auditory memory, and *vice versa,* must naturally be interpreted as due to variations in individual capacity. Modern pedagogy has slowly recognized these variations, and the greater prominence given to play, and to methods of precision, be they manual, lingual, auditorial, or visual, and less to distinctly formal methods of memorizing as a purely visual process from a printed page, may be regarded as evidence of this wider recognition that memory should be a generalized function, and not a pedantic cramming of any sort. A well-trained muscular system may be of far greater use to a man than any of his acquired knowledge. It is impossible to train certain children to do certain things, whereas in other directions training may result in great proficiency.

Disorders of Memory.— The disorders of memory fall into two classes, those of excess and those of defect. The general term for deficiency or loss of memory is amnesia, although this term fails to express the various distortions of memory, the illusions, or slight absences; and there are no technical words to distinguish temporary or permanent, periodic or progressive stages of the amnesic process. Inasmuch as memory is not one thing, but a great assemblage of processes which reflect a vast variety of psychological functions, situated not in the brain alone, but almost anywhere in the nervous system, a «defect in memory,» as defined by Jastrow, «is an expression of the incapacity of a group (or of certain groups) of centres to exercise their normal functions; or a tendency which they show to functionate in an abnormal manner.» Defects of memory may be general or special. General defects may be due to an incapacity on the part of nervous centres to establish residua. This type is found in those people who never remember what they see, and, notwithstanding frequent repetition of an act, never acquire proficiency in it. Occasionally a reverse general condition is manifest wherein the power of memory is unduly exalted and impressions of past experience reappear with unusual brilliancy. Such states are known in fevers, in intoxications of various kinds, alcohol, opium, etc., the hypnotic trance. Special defects may arise in which particular isolated experiences are cut out of the mind. Thus alcoholic amnesia, that may forget even a committed crime, is an illustration. Somnambulism and other hysterical states are characterized by defects of this special type. Another form of defect is observed when associated memory-groups are blotted out, as in the special disorder aphasia. (See APHASIA; SPEECH AND ITS DEFECTS.) Memory may be falsely localized in time, or in order; imaginary additions to real events may be present; or illusory remembrances of what has never been experienced occur.

Psychologically considered, memory defects may occur either in the storing or retentive part of the nerve-cells, or they may involve the much more complicated and associated process of reproduction of the retained images. Both processes may be involved at the same time. In imbecility, idiocy, dementia, etc., a born or acquired loss of retentive power is present. In pianists — for example, Paderewski — or chess-players — Morphy, Pillsbury, etc., a state of localized hypermnesia is present. This group would include all such prodigies. Occasionally one sees these two groups represented in one individual, as in an imbecile who has great power for mathematical calculation, etc. A case of this kind proves that the old assumption of closely localized memory-centres is false. Memory may be said to reside in all parts of the sensory nervous system. In another group the ordinary amnesias may be placed. These vary with each individual and depend largely on the healthy tone of the nervous system. A third group would include the paramnesias, or illusions of memory: (1) those of simple nature, involving a loss of distinction between imagination and real memory, a condition which is almost universal and in its exaggerated phases is seen in «constitutional liars,» many types of the insane being afflicted with this inability to distinguish; (2) double memory (identifying paramnesia), a very common form of memory-illusion, in which the thought of having seen, heard or felt «just that same thing before» is present; in some insanities this double memory being very prominent and often making «prophets»; (3) associated paramnesia, in which things actually experienced suggest false memories of things not experienced; this condition being seen in children, and often leading to false testimony. In this last class most of the «presentiments,» or antecedent knowledge of what has happened, may be grouped. It is largely on the basis of these suggested memories that faith-healing heals ills that really never existed save as suggested false memories. On these pseudo-reminiscences much of the fabric of spiritualism, second sight, and similar phenomena, is reared. See IDIOCY; PERSONALITY; SPEECH DISORDERS; and RETENTIVENESS.

Consult: Baldwin, 'Dictionary of Psychology and Philosophy'; Ribot, 'Diseases of Memory'; Guillon, 'Les Maladies de la Mèmoire,' with full consideration of hypermnesia (1897); Sallier, 'Troubles de la Mémoire' (1892); and Pardo, 'I disturbi della memoria' (1899).

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Memphis, mĕm'fĭs, Egypt, an ancient city near the apex of the Nile Delta, 12 miles south of Cairo, according to Herodotus, founded by Menes, the first king of Egypt. It was a large, rich, and splendid city, and the second capital of Egypt. After the fall of Thebes it became the sole capital. Among its buildings the temples of Phtha, Osiris, Serapis, etc., and its palaces were described as remarkable. At the time of the conquest of Egypt by Cambyses (524 B.C.) it was the chief commercial centre of the country, and was connected by canals with the Lakes of Mœris and Mareotis. With the rise of Alexandria the importance of Memphis declined, and it was finally destroyed by the Arabs in the 7th century. In Strabo's time (20 A.D.) it was, in population and size, next to Alexandria; in biblical history it is mentioned as Moph and Noph. The name Memphis is a corruption of Men-nofer «good abode.» Edrisi, in the 12th century, describes its remains as extant in his time. Among the works specified by him are a monolithic temple of granite 13½ feet high, 12 long, and 7 broad, entirely covered within and without with inscriptions, and statues of great beauty and dimensions, one of which was 45 feet high, of a single block of red granite. These ruins then extended about 9 miles in every direction, but the destruction has since been so great, chiefly for the construction of Fostat, an Arabic city on the opposite bank of the Nile, that although Pococke and Bruce fixed upon the village of Mitrahîneh as the site (where prone on a mound are two colossal statues of Rameses II.), this was not accurately ascertained until the French expedition to Egypt, when the discoveries of numerous heaps of rubbish, of blocks of granite covered with hieroglyphics and sculpture, and of colossal fragments scattered over a space of three leagues in circumference, decided the point.

Memphis, Mo., city, county-seat of Scotland County; on the Keokuk & Western railroad; about 160 miles north by west of Saint Louis. It is in an agricultural region, and is the trade centre for a large part of Scotland and adjacent counties. The principal out-going shipments are farm products and live-stock. There are bituminous coal fields in the vicinity. Pop. 2,400.

Memphis, Tenn., city, county-seat of Shelby County; on the Mississippi River, at the head of all-the-year-round navigation; on the Illinois Central, the Louisville & Nashville, the Yazoo & Mississippi Valley, the Kansas City, Memphis & Birmingham, the Saint Louis & San Francisco, the Choctaw, Oklahoma & Gulf, the Saint Louis, Iron Mountain & Southern, the Rock Island & Pacific, the Nashville, Chattanooga & Saint Louis, the Saint Louis & Southwestern, the Chicago, Saint Louis & New Orleans, the Southern, the Memphis & Gulf, and the Union R.R.'s. It has steamer connection with all the river and Gulf ports; 26 steamers call Memphis landing home. It is about 820 miles above New Orleans and 450 miles below Saint Louis. It is the largest city in Tennessee, the fifth in size of the cities on the Mississippi River, and the most important place between New Orleans and Saint Louis. It is noted for its extensive trade in cotton and cotton-seed products and in hardwood lumber. It has one of the only two bridges spanning the Mississippi River south of Saint

Louis. This is a steel cantilever bridge, 1,895 feet in length, costing $3,000,000, and opened to the public 12 May 1892.

Prior to 1880, Memphis was visited frequently by yellow fever, and in 1878 and 1879, passed through two terrible epidemics, losing about 5,000 of her population by death, and many thousand people left the city. This proved to be the turning point in her career, and since then, 210 miles of automatic, flush-tank, Waring system of sewers have been put in. The water supply of the city is obtained from 64 artesian wells, the average depth of which is about 400 feet. The present pumping capacity of the water supply is 30,000,000 gallons per day, and the daily consumption is 15,000,000 gallons. Among the cities of the United States with a population of 100,000 or over, Memphis ranks second in general healthfulness. The death rate is 12.75.

The city is well laid out and well built. The wide, well-shaded and well-paved streets, the fine public and private buildings, the parks with numerous large trees, all make the city most attractive. The combined park area is about 1,000 acres, besides two fine race tracks. The streets are paved with asphalt, vitrified brick, macadam, and gravel. About 250 miles of turnpike radiate from Memphis. Among the 850 industrial establishments are 11 cottonseed-oil mills, seven ice factories, seven grain elevators, 35 wholesale grocery houses, seven wholesale dry goods houses, seven wholesale drug houses, furniture factories, wood-working establishments of all kinds, foundries, machine shops, flour mills, pulp and paper mills, fibre plants, saddlery and harness factories, potteries, car works, pump works, wagon and carriage shops, cracker and candy factories, patent medicine works, sugar plantation machinery works, barrel and skewer factories, spoke factories, golf stick works, shuttle block works, trunk, screen door, and window factories, basket and box factories, egg case works, horse collar factories, engine and boiler works, refrigerator and cold storage machinery works, cotton gins, stove and range factories, handle and coffin factories, shaft and pole works, cider presses, distilleries, and breweries.

Among the prominent buildings are 123 churches, 65 schools and colleges, three public libraries, three first-class theatres, the customhouse, cotton exchange, Odd Fellows' building, Porter, Scimitar, and Equitable buildings, Masonic Temple, Gayoso Hotel, Woman's building, Randolph building, Goodwyn Institute, Memphis Trust building, Tennessee Trust building, a number of fine hotels, three large hospitals, and two orphan asylums. Memphis has a number of educational institutions, good public and parish and many private schools, the Memphis Hospital Medical College, the Maddox school for young women, the College of the Christian Brothers (R. C.), founded in 1871; Saint Agnes' Academy (R. C.), Sacred Heart Institute (R. C.), Saint Mary's School (P. E.), University School, and two public high schools. The Hannibal Medical College and the Le Moyne Normal Institute are for colored pupils. Five miles distant from the city is a National Cemetery, which contains 14,039 graves, of which 8,822 are those of unknown dead.

The annual expenditures for maintenance and operation are about $1,000,000. The combined capital and surplus of the several banks and trust companies are $6,000,000; the deposits $25,000,000. Building permits issued in one year were valued at $2,532,000. The progress the city is making at the present time is almost phenomenal. The growth of Memphis during the decade from 1890 to 1900 was greater than in any other decade of its existence. The population increased nearly 59 per cent. In 1890 the city had 250 manufacturing establishments, in 1900 more than 650, and 329 in 1909. Memphis is often spoken of as not only the metropolis of Tennessee, but also of Arkansas and Mississippi; the city is located in such a position as to be a great trading centre for each of these States.

The history of Memphis begins almost with the history of the United States. It was a landing and tenting place for the early explorers and missionaries. It was the home of the Chickasaw Indians, and the bluffs on which the city is located, 40 feet above high water and 80 feet above low water, have always been known as the Chickasaw Bluffs. In 1698 the French built forts on the site of what is now the city, and in 1794, the Spaniards erected forts at a time when Spain was claiming exclusive rights to lower Mississippi. Some of the foremost men in the United States owned lands in this vicinity and were interested in holding for their own country a right to free navigation on the Mississippi to the Gulf. Andrew Jackson, James Winchester, and John Overton sent to Memphis, in 1819, a small colony who established the first permanent settlement. In 1826 there were 500 persons in the settlement which was then incorporated as a town, and in 1849 a city charter was granted. The Union and Confederate forces tried to gain possession of the city at the beginning of the Civil War. On 6 June 1862 a Federal fleet under Commodore Davis conquered a Confederate fleet under Commodore Montgomery, thus placing Memphis in possession of the Union forces. General Forrest in command of Confederate forces entered the city in August 1864 and took several hundred prisoners.

Memphis has always progressed commercially except during the Civil War, and when visited by the yellow fever epidemics. The great growth industrially has come within the last few years. The location is making the city a great railroad centre; the surrounding forests are making it a great industrial centre; and the alluvial lands of the Saint Francis Basin, Yazoo Delta, and the Valley of the Mississippi River will always make her a great commercial centre. In 1855 yellow fever attacked the city, and again in 1867, 1873, 1878, and 1879. The epidemics of 1878 and 1879 so paralyzed the industries of the city, that in 1879 Memphis was unable to liquidate the current indebtedness and the charter as a city was revoked. The former city was designated by the State Legislature as "the taxing district of Shelby County." The control of the district was vested in a board of public works composed of five members, and a governing council composed of three commissioners. The council instituted the sewerage improvements, liquidated the debts, and in 1891 the place was reincorporated and again chartered as a city. Memphis lost lives, property, trade, and credit; but the history of the deeds of heroism performed by many during the fearful yellow fever epidemic overshadows in importance the history of financial difficulties.

Since the Federal census of 1890, the city limits have been extended; but the population as given in 1890 included both urban and suburban districts, and the increase from 1890 to 1900 was remarkable. The growth of the city may be seen from the Federal census reports. Pop. (1850) 8,841; (1860) 22,623; (1870) 40,-226; (1880) 33,592; (1890) 64,495; (1900) 102,-320. In 1900 less than 5 per cent were foreign born, and nearly 50,000 were of negro descent. The census of 1910 gave the population as 131,-105, an increase of 28.1 per cent.

Consult: Davis, ‘History of the City of Memphis’ (1873); Keating and Vedder, ‘History of the City of Memphis’ (1888).

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Memphis (Tenn.), Capture of. At dusk 5 June 1862 the Union flotilla under command of Com. C. H. Davis appeared near Memphis and anchored two miles above the city. The Confederate flotilla, Com. J. E. Montgomery, commanding, was lying at the Memphis levee. At daylight the Union fleet began to drop down toward the city, and the Confederates advanced to meet it. There were no troops protecting the city. The flotillas were composed of the following vessels:

Union	Guns	Confederate	Guns
Benton	16	Little Rebel	2
Louisville	13	Bragg	3
Carondelet	13	Beauregard	4
Cairo	13	Price	4
St. Louis	13	Sumter	3
Queen of the West	ram	Lovell	4
Switzerland	ram	Thompson	4
Monarch	ram	Van Dorn	4
Lancaster	ram		
	68		28

Besides having more than twice the number of guns, the Union ordnance was much superior to that of the Confederates. The latter, however, made a desperate fight, which finally ended ten miles below the city, with the result that the Lovell, Beauregard and Thompson were destroyed; and the Little Rebel, Price, Sumter, and Bragg captured. The Van Dorn escaped. On the Union side only the Queen of the West was disabled.

Immediately after the fight the mayor, in reply to a summons to surrender, informed Com. Davis that there were no troops with which to oppose him. The next morning detachments from troops under Col. G. N. Fitch, which accompanied the fleet, landed and took possession of the city.

Gen. Grant arrived at Memphis 23 June, and established the headquarters of the District of West Tennessee. He was recalled to Corinth 15 July, and Gen. Sherman was ordered to Memphis, reaching the city 21 July. He restored the mayor and the city government, and made them responsible for civil order. He continued in command at Memphis until his forces left to join Gen. Grant in the final campaign for Vicksburg, having previously participated in the first move against that city.

The raid of Gen. N. B. Forrest, of Confederate cavalry fame, into Memphis occurred 21 Aug. 1864. The Union forces and commanding officers were completely surprised, and barely escaped capture. Gen. C. C. Washburn, in command of the District of West Tennessee; Gen. R. P. Buckland of the District of Memphis, and Gen. S. A. Hurlbut, were asleep in the city. Gen. Forrest left the vicinity of Oxford 18 August, with three brigades, making a forced march of nearly 100 miles. A strong detachment rode into the city at 4 o'clock in the morning, running over a regiment of 100-days men on picket, and capturing about 250 of them. This force divided into three, and at once surrounded the quarters of the three officers named. Each, however, escaped, Gen. Buckland succeeded in reaching his troops and promptly directing offensive operations. With the exception of inconsiderable skirmishes in its vicinity, Memphis thereafter remained in undisturbed Union control.

H. V. Boynton.

Memphremagog, mĕm-frĕ-mā'gŏg, a lake in the southern part of the province of Quebec, Canada, extending into Orleans County, in Vermont. It is about 32 miles long, north and south, and from three quarters of a mile to four miles wide. It is irregular in shape, and along its shores are several striking indentations, in some places low and in some other parts high and rocky. The land on the west shore is mountainous, the altitude of the highest points being about 2,800 feet. The outlet is the Magog River, which flows into the Saint Francis river. Along the shore are a number of villages, and in summer a steamer plies daily on the lake, connecting the chief towns and villages.

Mena, Juan de, Spanish poet: b. Cordova, Spain, about 1411; d. 1456. He was educated at Salamanca and at Rome and afterward was appointed secretary and court historian to John II., King of Castile. His allegorical poems, ‘Coplas de los Siete Pecados Mortales,’ ‘Le Coronacion,’ and ‘El Laberinto’ (The Labyrinth), a poem founded on the ‘Divina Commedia’ and published in the year 1496, all show the influence of Dante, for whom he held great respect and admiration. They were very popular, but possessed little literary merit. His collected works were published in 1528, entitled ‘Copilación de todas las obras de Juan de Mena.’

Menabrea, Luigi Federigo, Count, Italian soldier and statesman: b. Chambéry, in Savoy, 4 Sept. 1809; d. there 25 May 1896. After completing a course in mathematics at the University of Turin and joining the engineers in the Sardinian army, he accepted the professorship of technical science at the military academy and at the University of Turin. Having been promoted to the rank of captain, he was used in the diplomatic corps for some time; was then elected deputy, serving both under the minister of war and the minister of the interior; and upon the outbreak of the war of Sardinia and France against Austria in 1859 he was appointed chief of the engineer corps. After Savoy was ceded to France, Menabrea was made a senator by Victor Emmanuel, and chief of the department of engineers, and as such planned the fortifications of Bologna, Piacenza, and Pavia; in 1860 he was created a lieutenant-general, in that year laying siege to and after three months of fighting taking Gæta. In 1861 he joined the cabinet of Ricasoli as minister of marine, in 1862 also taking over the portfolio of minister of public works. In 1866 he was Italian ambassador to the council which brought about the Treaty of Prague and ceded Venice to Italy. In 1867, when Rattazzi resigned, he formed a new ministry, himself becoming minister of foreign affairs. As premier he did much to place Italy in cordial relations with the outside world, and to settle internal dissensions, but his imprisonment of Garibaldi, and the prevalent financial straits of the nation lost to him the confidence of the House of Deputies, and on 16 Nov. 1869 he resigned. In 1870 he became Italian ambassador at Vienna, was appointed to the same post at London in 1876, and in 1882 went to Paris, where he was stationed for 10 years. The most important of his works are: ‘Etudes sur la série de Lagrange’ (Turin 1844–7); ‘Le genie italien dans la campagne d'Ancone et de la Basse-Italie’ (Paris 1866); and ‘République et Monarchie dans l'état actuel de la France’ (1871).

Menage, Gilles, French philologist and satirist: b. Angers 15 Aug. 1613; d. Paris 23 July 1692. After completing his early studies he became an advocate, practising for some time at Paris, but, having conceived a profound disgust for that profession and all its adherents, he became an ecclesiastic, and for some time was a member of the household of the Cardinal de Retz, but subsequently took up his residence in the cloister of Notre Dame. A witty satire, entitled ‘Requéte des Dictionnaires,’ published shortly after this time and aimed at the ‘Dictionary’ of the French Academy, prevented his becoming a member of that society. His most important works are: ‘Dictionnaire étymologique, ou Origines de la Langue Française’ (1650–94); ‘Origines de la Langue Italienne’ (1669); ‘Miscellanea’; ‘Remarques sur la Langue Française’; ‘Historia Mulierum Philosophorum’; ‘Poésies Latines, Italiennes, Grecques, et Françaises’; and ‘Anti-Baillet.’

Menagerie, a collection of wild animals, exhibited in zoological gardens, in museums, and by circus companies traveling from city to city. See Circus; Zoological Gardens.

Menai (mĕn'ī) **Strait,** the channel between Wales and the island of Anglesey, is 13 miles long, and varies in width from 250 yards to two miles. A suspension bridge and the celebrated Britannia Tubular Bridge connect Anglesey with the mainland. See Bridges.

Menam, mā-näm', or **Meinam,** the chief river of Siam, rising in the Laos country, and flowing generally southward to enter the Gulf of Siam below Bangkok. Its length is about 900 miles, and for a considerable portion of its course it is navigable for small craft. It is subject to periodical overflows on which the crops of the rice fields along its banks are dependent.

Menan'der, the name of two Greek writers, (1) the comic dramatist: b. Athens, 342 B.C.; d. there 290 B.C. He was the pupil of Theophrastus, himself the pupil and successor of Aristotle as head of the Peripatetics, and author of ‘Characteres,’ a somewhat more literary and popular enlargement of some ruling ideas of the Nicomachæan Ethics; he was by such a teacher well trained for his dramatic vocation. He was, moreover, a friend of Epicurus from early life, and may thus have been imbued with that bonhommie which rendered him so genial an interpreter of manners. He wrote a hundred comedies which are distinguished from those of Aristophanes by their refinement, their freedom from personal and political virulence, and their graceful, sometimes beautiful, delineation of feminine character. He was, however, outrivaled in popular favor by his contemporary Philemon, whose ribaldry was irresistible to the Athenian playgoers. Only some fragments of his works survive in the original, the most important of these relics having come to light in Egypt (1898). He was, however, closely imitated by Plautus and Terence, and in the ‘Bacchides,’ ‘Stichus,’ and ‘Poenulus’ of the former, and the ‘Andria,’ ‘Eunuchus,’ ‘Heautontimorumenos,’ and ‘Adelphi’ of the latter we have very good representatives of the Greek dramatist's method and spirit. A fine antique statue of Menander is to be seen in the Vatican. (2) A Greek rhetorician who flourished in the latter half of the 3d century B.C. He has left the rhetorical treatise ‘De Encomiis,’ and from his analyses of the orations of Demosthenes, most of the scholia on that orator have been compiled. Consult: (on Menander the dramatist), Guizot, ‘Ménandre’ (1855); Horkel, ‘Lebensweisheit des Komikers Menander’ (1857); (on Menander the rhetorician), Ritschl, ‘Der Rhetor Menander und die Scholien zu Demosthenes’ (1883).

Menant, Joachim, French Assyriologist and jurist: b. Cherbourg 16 April 1820; d. Paris 30 Aug. 1899. Having studied law he was appointed to the magistracy of the civic tribunal in the city of Havre, but soon turned his attention to deciphering the old Assyrian inscriptions, for which he was elected a member of the Académie des Inscriptions. Chief among his works are: ‘Zoroastre’ (1844); ‘Recueil d' Alphabets des Écritures cunéiformes’ (1860); ‘Eléments d' Epigraphie assyrienne’ (1860); ‘Inscriptions assyriennes des briques de Babylone’ (1860); ‘Inscriptions de Hammourabi, roi de Babylone au XVI. siècle avant notre ère’ (1863); ‘Exposé des Éléments de la Grammaire Assyrienne’ (1868); ‘Leçons d' épigraphie assyrienne profesées aux libres de la Sorbonne’ (1873); a collection of texts, ‘Annales des rois d' Assyrie’ (1874), and ‘Babylone et la Chaldée’ (1875); ‘Manuel de la langue assyrienne’ (1880).

Ménard, mā-när, **Michel Branamour,** American pioneer: b. Laprairie, Lower Canada, 1805; d. 1856. He was of French parentage, and after working some time for a Detroit fur-trading company entered the service of his uncle, also a fur-trader, in Missouri. The Shawnees made him their chief, and he acquired great power among various Indian tribes. Soon after 1830 he went to Texas, where he continued fur-trading with the Indians, and also dealt with Mexicans. When the Texans revolted against Mexico he held the Indians in check and kept them from acting against the insurgents. As a member of the convention at which the Texans declared their independence, and afterward of the Congress of Texas, he exerted an influence in the formation of that State. The greater part of the site of Galveston was included in a purchase made by him in 1836, and of that city he, more than any other man, is to be considered the founder.

Menasha, mē-năsh'ạ, Wis., city, in Winnebago County; at the mouth of the Fox River, on

Lake Winnebago, on the Government Canal of the Fox and Wisconsin River Improvement Company, and on the Chicago, M. & St. P., the Wisconsin C., and the Chicago & N. W. R.R.'s, about 90 miles north by west of Milwaukee. The first permanent settlement was made in 1847 and the incorporation was in 1874. Menasha, like other places on Lake Winnebago, is a favorite summer resort. It is in an agricultural region in which the lumber interests are prominent. The chief manufactures are flour, lumber, paper, brick, machine-shop products, woodenware, furniture, and woolen goods. The city has good public and parish schools, and a public library. Pop. (1890) 4,581; (1900) 5,589; (1910) 6,081

Menasse, mā-nās'ā, **Ben Israel,** Jewish scholar and writer: b. Lisbon 1604; d. Middelburg 20 Nov. 1657. He was in his 18th year rabbi of a synagogue in Amsterdam; mastered 10 languages, and published numerous works on theology and hermeneutics. After the decapitation of Charles I. of England, he took measures to secure a repeal of the statute of Edward I., by which Jews were excluded from England. Cromwell appointed a commission to consider his petition, and in 1655 the legal restrictions were removed. Among his most notable works is 'Vindiciæ Judæorum,' which was translated into German by Mendelssohn, 1782. Consult Kayserling, 'Menasse Ben Israel' (1861).

Mencius, mĕn'shĭ-ŭs, the Latinized name of Meng-tse, that is, Meng the Teacher, a Chinese philosopher and recluse: b. Province of Shan-Tung about 372 B.C.; d. there about 289 B.C. He was educated by his mother with such success that the approbation contained in the phrase «the mother of Meng» has become proverbial. Mencius was one of the greatest of the early Confucians. During his time the governments of China were oppressive, and Mencius for many years wandered about in search of a prince who would consent to govern in accordance with true and just principles. Failing to find any such, he retired to his former seclusion and spent the rest of his life in perfecting his system and training up disciples. His works contain some enlightened views on man and society. He believed in the moral nature of man and had unbounded faith in the possibilities of progress under a good social and political system. He regarded all governments as from God, but at the same time he believed in the responsibility of rulers to their people and the people's right to depose or even put to death unworthy rulers. In a nation the people are the most important element, second comes the government, and third the monarch. The aim of a government, according to him, should be the happiness and education of the people, and any ruler who was content to leave his subjects in ignorance and misery deserved to be deposed. The teachings of Mencius were written out by his disciples in dialogue form, under the title 'The Book of Mencius,' which has been translated into Latin by Julien (1824) and into English by Collin (1828). Consult: Legge, 'Life and Works of Mencius' (1875); Faber, 'Lehrbegriff des Philosophen Mencius' (1877); Watters, 'A Guide to the Tablets in a Temple of Confucius' (1879).

Men'daites. See NAZAREANS.

Mende'ans. See NAZAREANS.

Mendel, Johann Gregor, abbot of Brünn, now known as the discoverer of the law named after him (see HEREDITY): b. Heinzendorf bei Adrau, Austrian Silesia, 22 July 1822, of peasant parents; d. 6 Jan. 1884. In 1843 he entered the Königingkloster, an Augustinian foundation in Altbrünn, as a novice; and was ordained priest in 1847. From 1851–3 he studied natural science at Vienna; and, on his return to the cloister, taught in the Realschule. About 1869 he became abbot of Brünn; and later took part in the Ultramontane movement. It was in 1854 that he began those experiments, on *Pisum,* in the cloister gardens, that, after the lapse of half a century, have brought him posthumous fame. In 1865 he contributed his now memorable paper, 'Versuche über Pflanzenhydriden,' to the Society of Naturalists of Brünn; and, in 1869, another, on *Hieracium* hybrids. After 1869 he seems to have discontinued his work in hybridizing, and died unrecognized by science. This seems inexplicable, as his researches were of a nature to commend them to his studious contemporaries, among them Darwin, who entirely missed his contribution, even though the Brünn society exchanged with the Royal Society of London. But Mendel had the satisfaction of realizing that he had established a law in heredity as to the numerical ratios of the types developed in hybridizing — the grand fact for which we now prize his unobtrusive labors. He called himself a student of Kollar; and for some time he was president of the Brünn society. Since the verification of his experiments, simultaneously, in 1900, by De Vries, in Holland, Correns, in Germany, and Tschermak, in Austria, and of the translation of his paper appearing in the 'Journal of the Royal Horticultural Society of England' (1901), the literature has been full of «Mendel's Law.»

Mendeleeff, Dimitri Ivanovitch, Russian chemist: b. Tobolsk, Siberia, 7 Feb. 1834; d. Saint Petersburg, 2 Feb. 1907. He studied at the Institute of Pedagogy, Saint Petersburg, where he gave special attention to natural science; in 1856 became docent at the University of Saint Petersburg; was at Heidelberg in 1859–61, where he published his monograph 'On the Capillarity of Gases,' soon followed by 'Organic Chemistry.' In 1863 he became professor of chemistry at the Saint Petersburg Institute of Technology, and in 1866 was appointed to a similar professorship in the University of Saint Petersburg. The results of his researches on the compression of gases, which he closely pursued from 1871 to 1875, were set forth in his work 'On the Elasticity of Gases.' He was commissioned in 1876 to report upon the petroleum industry in the Caucasus regions and in Pennsylvania. His 'Aqueous Solutions' (1886), a work on experimental chemistry, has taken its place among the most important contributions to that branch of science. In 1890 his 'Tariff Elucidated' presented the protectionist views of which he had already become a well-known advocate, and which, as a member of the Council of Commerce and Industries, he actively propagated. When the Chamber of Weights and Measures was established by the Department of Finance, in 1893, he was appointed conservator of the weights and measures. His proof of the periodic law (q.v.), first presented in 'Elements of Chemistry' (1868–70), is his crowning achievement in pure science. Consult Thorpe, 'Essays in Historical Chemistry' (1894).

Men'del's Law (of Heredity). See HEREDITY.

Mendelssohn, mĕn'dĕls-sōn, **Moses,** German Jewish philosopher: b. Dessau, Germany, 6 Sept. 1729; d. Berlin 4 Jan. 1786. His father, Mendel, a schoolmaster, though very poor, gave him a careful education. He lived several years on the charity of persons of his own religion, devoting his time to study, chiefly in Hebrew and Hebrew literature, but also in mathematics and modern languages. In 1750 he was appointed by a silk manufacturer named Bernhard, a Jew, tutor of his children. At a later period Bernhard took him as a partner in his business. In 1754 he became acquainted with Lessing, with whom he contracted a close intimacy, which had a great influence on his mind. Intellectual philosophy now became his chief study. His 'Briefe über die Empfindungen' were the first-fruit of his labors in this branch. Mendelssohn contributed to several of the first periodicals, and now and then appeared before the public with philosophical works, which brought him fame, not only in Germany, but also in foreign countries. The most celebrated of these is 'Phædon,' a treatise on the immortality of the soul, first published in 1767. Since that time it has gone through numerous editions, and been translated into most European languages. He established no new system, but was, nevertheless, one of the most profound and patient thinkers of his age, and the excellence of his character was enhanced by his modesty, uprightness, and amiable disposition. He knew how to elude with delicacy the zealous efforts of Lavater to induce him to declare himself a Christian. To this encounter between Lavater and Mendelssohn German literature owes one of its greatest dramas, Lessing's 'Nathan der Weise,' in which the author, in the person of the hero, commemorates the virtues, the tolerant spirit, and comprehensive mind of his friend Mendelssohn. His 'Jerusalem, oder über religiöse Macht und Judenthum' (1783) was much misunderstood, partly because he attacked many deep-rooted prejudices of his race. 'Morning Hours' (Morgenstunden) was published in 1785. The last work of Mendelssohn was in defense of his friend Lessing, of whom Jacobi had asserted that he was a Spinozist, was entitled 'Moses Mendelssohn und die Freunde Lessings' (1786). Consult Kayserling, 'Moses Mendelssohn' (1882).

Mendelssohn-Bartholdy, Jakob Ludwig Felix, German composer: b. Hamburg, 5 Feb. 1809; d. Leipsic 4 Nov. 1847. The kindly influences which, like a halo, encircled the life of the illustrious man, are reflected in many of his best compositions. He was born in prosperity, reared in plenty, and at nearly all times was surrounded by conditions conducive to success. It has been said that in no way was Mendelssohn's naturalness and naïveté more evident than in his constant reference to his own foibles; and further, that the hearty way in which he enjoyed idleness and boasted of it, were delightful in a man who got through so much work, who was singularly temperate, and whose only weakness for the products of the kitchen was for rice, milk and cherry pie. «I do not in the least concern myself,» said he, «as to what people wish or praise or pay for; but solely as to what I myself consider good.»

It is doubtful whether the history of any other great musician discloses so wide a combination of qualities. Some of his biographers have expressed the thought that his happy disposition prevented his work from attaining that degree of depth which it might have done had his genius been subjected to fiery trials. Be this as it may, the fact remains that among all the German composers there is not one who has enjoyed such universal popularity, certainly in America and England, as Mendelssohn. His oratorios, 'St. Paul' and 'Elijah,' are sung everywhere, while his 'Hymn of Praise,' the 'Overture to the Hebrides,' his symphonies, sonatas, concert-overtures, settings for certain Psalms, and 'Songs without Words' are familiar to all.

Seventy-two of Mendelssohn's numbered works were published before his death, and 47 later, while 23 of his compositions, many of them including two or more pieces, had no «opus» numbers assigned to them. Six other of his published compositions have been recorded, while his unpublished pieces, mostly in autograph, and principally composed before he was of age, are quite numerous, including 12 symphonies, several fugues, concertos, sonatas, studies, fantasias, etc.

Felix was the second child and eldest son of Abraham Mendelssohn, a Jewish banker of Hamburg, and Lea (or Leah) Salomon, a resident of Berlin, and a Jewish lady of considerable property and attainments, to whom he was married on 26 Dec. 1804. The grandfather of Felix was Moses Mendelssohn (q.v.), who settled in Berlin in 1762 and married Fromet, daughter of Abraham Gugenheim, of Hamburg. Moses' father was named Mendel, a poor Jewish schoolmaster of Dessau, on the Elbe. Thus the name Mendelssohn (son of Mendel) simply perpetuates the oriental method of name-making.

When not three years old Felix was taken to Berlin, and five years later (1816) his father took him and his sister Fanny, four years the senior of Felix, to Paris on a business trip. While there they both received lessons on the piano from Madame Bigot, but it was not till after their return to Berlin that their systematic education commenced. Ludwig Berger became their piano instructor, and Zelter taught them thorough-bass and composition. In 1824 Moscheles became acquainted with the family, and while he declined to accept Felix as a pupil, consented to offer him suggestions and advice. In the same year Spohr visited Berlin and renewed his friendship with the family, which had been formed at Cassel in the summer of 1822 where the family had gone for the purpose of introducing Felix to him. In his 8th year Felix played the piano with remarkable ability, and about a year later (1818) he made his first formal public appearance. This was at a concert given by Joseph Gugel, a virtuoso on the horn. At 11 he joined the Singakademie as an alto. In 1820 Felix commenced systematic work as a composer, although before that time he had written from 50 to 60 complete movements. The earliest date of which a dated autograph is preserved was attached to a cantata entitled 'In rührend

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feierlichen Tönen,' which he completed on 13 January of that year.

The following year was eventful. He composed five symphonies, nine fugues, several pieces for the piano, two operettas, and a number of songs. It was in this year, too, that he visited Goethe at Weimar. The poet was delighted with his talent. While at Weimar he played before the Grand Duke and Duchess and improvised before the Court and also before Hummel. His compositions in 1822 were very numerous, and during this and the following year he wrote six symphonies, five concertos, a piano quartette, a violin sonata, a Magnificat and Gloria, and an opera in three acts, entitled 'Die beiden Neffen, oder der Onkel aus Boston.' On 31 March he played for the second time in public, at Aloys Schmitt's concert, taking part in a duo for two pianos, and again, on 5 December, he played at a concert given by Madame Milder-Hauptmann, when he gave one of his own concertos. It was probably in this year, too, that the practice of having informal musical performances on alternate Sunday mornings at the Mendelssohn home was begun. Felix directed, his sister Fanny presided at the piano, his younger brother, Paul, played on the cello, and his second sister, Rebecca, sang.

In 1824 his musical genius showed marked advance, as evidenced in his symphony in C minor, composed between March 3 and 31. In the sumer he was taken to Doberan on the Baltic, a seaside resort, and there received the impressions which later found expression in his 'Meeresstille Ouverture.' His wonderful power of extemporizing and his readiness to play the music of other composers are noteworthy features, and Hiller, who was with him in Frankfort in 1825, was carried away with his performances. In this year he met Cherubini in Paris, whither he accompanied his father on a visit. Toward the end of 1825 Mendelssohn's father purchased a large mansion, surrounded by spacious grounds, and under the influence of this charming home he became more and more devoted to his work. The beauties of Shakespeare were here unfolded to him. Felix was especially charmed with the 'Midsummer Night's Dream,' and probably then conceived the idea of the exquisite composition bearing that name which forms opus 61 and was first produced in Potsdam 14 Oct. 1843. The overture to a 'Midsummer Night's Dream' appeared earlier, and as a piano duet, its first public performance being given at Stettin in February 1827. Either during this or the previous year, Felix entered the University of Berlin, where he showed evidences of decided literary powers. On his return from Stettin he made preparations for his opera 'Die Hochzeit des Camacho,' but owing to the opposition of the director, Spontini, it was performed only once at that time, although, strange to relate, a complete performance of it was given at Boston, Mass., on 19 March 1855.

The principal compositions during 1828 were a cantata for the Tercentenary Festival of Albrecht Dürer, a cantata for a Congress of Science, an Antiphona for four voices, and a concert overture. He also completed his overture to Goethe's 'Calm Sea and Prosperous Voyage.' During this year he organized a choir of 16 voices for practising Bach's Passion music. The year 1829 was an important one for Felix. Hitherto his father had not permitted him to regard himself as a professional musician, but this now being determined on, arrangements were made for him to visit some of the great capitals, with a view to gaining materials for his greatest works. His first journey was to England, where he arrived on 21 April 1829. He was received with much enthusiasm and also scored a success in society. His delightful manners and unfailing animation charmed every one. In November he was again in Berlin, and during the winter he completed the 'Reformation Symphony' for the Tercentenary Festival of the Augsburg Confession. He declined the professorship of music in the University, preferring to carry out the program which his father had mapped out for him. In May 1830 he visited Weimar, where he again met Goethe, afterward going to Munich, and later to Italy. Preparations for his return began in June 1831, and after visiting many cities he arrived in Munich, where his concerto in G minor was performed for the first time on 17 October.

Another visit to London was made in the spring of 1832, during which he composed with unabated vigor. Among the more important productions of this time were his musical representation of Goethe's 'Walpurgis Night,' and the 'Fingal Overture,' which was finished in Rome. Again in Berlin in July 1832, he gave several concerts, producing the 'Walpurgis Night 'at one of them. His time was fully occupied in composing, playing and conducting. His 'Italian' symphony was completed in March 1833, and sent to London where it was produced on 13 May under his personal direction. Later in the month, we find him conducting the Lower Rhine festival in Düsseldorf, where, as a result of his success, he was engaged as director of "all the public and private establishments of the town" for three years with a salary of 600 thalers. He resigned, however, during the 2d year to accept the position of conductor of the famous Gewandhaus Concerts at Leipsic, then considered the highest position in the musical world of Germany. Thither he proceeded in August 1835, to make arrangements for the season which began on the 4th of October following. Seven concerts were given between that date and 20 November, when he was shocked by the news of his father's death which had occurred the day before. For the first time his radiant disposition forsook him and he fell into a despondent mood. During this season of sadness, however, he was able to finish the oratorio of 'St. Paul' while he also maintained the excellence of the concerts for which he was responsible. The great oratorio was first produced at the Lower Rhine Festival at Düsseldorf 22 May 1836. About this time he took charge of the Frankfort Cäcilien-Verein during the illness of the director, and there made the friendship of Madame Jean-Renaud and her family. He became devotedly attached to her youngest daughter, Cécile, to whom he was married on 28 March 1837. Returning to Leipsic he conducted another successful season, closing with a performance of 'St. Paul,' for the first time produced in that city. In August 1837, he left his bride for the purpose of conducting 'St. Paul' at the Birmingham Festival. This was his fifth journey to England, and before he returned he held conferences with his friend Klingemann over the plan of a new oratorio having the prophet Elijah as the central figure. He reached Leipsic on 1 October in time to conduct the first concert of the Gewandhaus on the same evening.

The year 1839 was notable for the composition of the 'Ruy Blas' overture for the Leipsic theatre, and the setting of the 114th Psalm to music. In the following year the invention of printing was celebrated in Leipsic by a festival, and the 'Festgesang,' for men's voices, and 'Lobegesang,' or 'Hymn of Praise,' were composed for the occasion. During this year Mendelssohn accepted the direction of the musical department of the Berlin National Academy of Arts, but before entering on his duties, he made another visit to Birmingham to conduct a performance of the 'Hymn of Praise.' On his return he was installed as General-Musik-Director in Berlin, but having the privilege of living where he pleased, he returned to Leipsic. About this time he composed the music for the 'Antigone' and 'Œdipus Coloneus' of Sophocles, Racine's 'Athalie' and Shakespeare's 'Tempest' and 'Midsummer Night's Dream.'

Another sad trial now befell him in the death of his mother, 12 Dec. 1842, and in November of the following year he removed to Berlin. The king of Saxony had recently established a Conservatory of Music, a plan which Mendelssohn had long cherished, and he and Schumann were appointed professors of composition and the piano. Meanwhile the Gewandhaus concerts were left in charge of Hiller. In 1844, he visited London for the eighth time in response to an invitation to direct several concerts of the London Philharmonic Society. In October he resigned his position as General-Musik-Director in Berlin, and took a much needed rest until the autumn of 1845 when he again assumed charge of the Gewandhaus orchestra.

Early in 1846 he was back in Leipsic where he took charge of two classes in piano and composition, and among his pupils were Goldschmidt, De Sentis, Tausch and others. The season of 1845-6 was unusually brilliant in concert work, and the programmes showed a great breadth of selection. At the eighth concert he brought with him Jenny Lind, who was then heard for the first time in Leipsic. On 5 Aug. 1846, a preliminary rehearsal of 'Elijah' was held in Leipsic, and soon after he started for England on his ninth visit, the complete score having been sent over a month earlier for translation. First there was a rehearsal with piano accompaniment at Moscheles' house, followed by two full rehearsals at the Hanover Square Rooms, and later by rehearsals in Birmingham, where on 26 August the oratorio was performed for the first time in public. One of his biographers states that "there was a mad rush at the close of the performance to grasp the hand of the hero of the day, who thanked all present for their share in the performance with which he was so deeply gratified." Returning to Leipsic he remodeled the oratorio, however, making so many changes that scarcely a movement stands to-day as it was originally written. The completed edition was published in July 1847. The Sacred Harmonic Society of London now invited Mendelssohn to give a production of 'Elijah' in its revised form in Exeter Hall, and for the tenth and last time he visited London in April 1847. Four performances were given Queen Victoria and the Prince Consort being present at the second of the series. After giving other productions of the 'Elijah' in Manchester and Birmingham, followed by a performance with the Philharmonic Society, he returned to Frankfort, weary and utterly worn out. To add to his now unhappy condition, his sister Fanny, whom he had loved devotedly, was stricken with paralysis, and died 14 May 1847. On hearing the sad news he fell fainting and for several weeks was utterly prostrated. Seeking diversion, he revisited Switzerland during the summer, where, it is said, he applied himself to water-color painting and made excellent progress in that direction. Later he resumed composition, numbering among his productions at that time the beautiful quartet in F minor (Opus 80), and he also wrote some parts of a newly commenced oratorio, 'Christus.' He returned to Leipsic in September, but attempted nothing serious in a musical way. His spirit was broken, and he dreaded to appear in public. The beginning of the end came on 9 October while calling on Madame Frege, whom he was accompanying in his last set of songs. She left the room to order lights, says one of his biographers, and on her return found him shivering and suffering violent pains in the head. He rallied somewhat, but another relapse occurred on 3 November, and he never spoke again. He died the following day, and on Sunday, the 7th, was borne to the Paulinen-Kirche, preceded by a band playing one of his 'Lieder ohne Worte' (Book V., No. 3), which Moscheles had scored for the occasion. Thence the coffin was taken to the Alte Dreifaltigkeits-Kirchhof in Berlin, where it was deposited in its last resting place.

A cross on the grave bears this inscription: "Jakob Ludwig Felix Mendelssohn-Bartholdy: geboren zu Hamburg, am 3. Feb. 1809; gestorben zu Leipzig am 4. Nov. 1847."

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R. I. Geare,
U. S. National Museum.

Mendenhall, men'dĕn-hâl, **Thomas Corwin,** American physicist: b. near Hanovertown, Ohio, 4 Oct. 1841. He was educated in the public schools and by his own efforts obtained a knowledge of physics and higher mathematics. In 1873 he became professor of physics and mechanics in the Ohio University, where he remained until 1878, when he accepted a call to the chair of physics at the Imperial University in Tokyo, Japan. There he founded a laboratory, an observatory, a scientific society, inaugurated a system of lectures, which work was highly approved by the Japanese government. In 1881 he returned to the Ohio University, and in 1884 accepted a position in the Signal Service at Washington. In 1886 he was elected president of the Rose Polytechnic Institute, but resigned in 1889 to become superintendent of the United States Coast and Geodetic Survey, and from 1894–1901 was president of the Worcester Polytechnic Institute. He has published several scientific papers and a book entitled 'A Century of Electricity' (1887).

Mendes, Catulle, ka̱-tül mŏṅ-dạ̄s, French writer: b. Bordeaux 22 May 1841; d. Paris 8 Feb. 1909. His verse is marked by extreme devotion to form. He also wrote a great deal of prose — short stories, longer works of fiction, dramas. There is much affectation about them all. Among his books are: 'Poésies' (1878); 'Monstres Parisiens' (1882); 'La Rose et le Noir' (1885); 'Grande Maguet' (1888). Of his plays may be cited 'Le Capitaine Fracasse' (1872) and 'Fiamette' (1889).

Mendes Leal da Silva, José, hō-sā' mäṅ'-dāsh lā-äl' dä sēl'vä, Portuguese statesman and poet: b. Lisbon 18 Oct. 1818; d. Cintra 14 Aug. 1886. He was minister of the navy and of foreign affairs; ambassador to France 1874–83; and to Spain 1883–6. His vogue as a poet has been very great in his own country and his 'Songs' ('Canticos') were first collected in 1858. He wrote also a large number of plays, some of them very popular on the Portuguese stage, as 'Uncle Andrew from Brazil'; and 'The Sportsman'; and also several romances. He became a member of the Portuguese Academy in 1845.

Mendez-Pinto, mān'dāsh pēn'too, **Fernao,** or **Fernam,** Portuguese traveler: b. Montemor-o-Velho, near Coimbra, Portugal, about 1510; d. Almada, near Lisbon, Portugal, 8 July 1583. He departed for the Indies in 1537, returning in 1558, and after his death a very curious relation of his voyages, 'Perigrinacao de Fernam Mendez-Pinto' was published, which has been translated into French, English, and other European tongues. Congreve, in his 'Love for Love,' called him "a liar of the first magnitude," and from that time his narrative was considered as a romance; but his good faith and veracity are now generally admitted.

Mendiburu, mān-dē-boo'roo, **Manuel de,** Peruvian soldier and historian: b. Lima 1805; d. there 21 Jan. 1885. While a student he joined the patriot forces in 1821, was captured by the Spanish and held prisoner till the close of the war. Among various civil and military posts afterward held by him were those of minister of war and finance. He published a 'Diccionario historico-geografico del Peru,' a work of great value and highly prized by scholars. The first part, in eight volumes, deals with the Inca and colonial periods, and its publication, begun in 1874, was concluded after General Mendiburu's death. The second part has not been published.

Men'dicancy, a condition of permanent pauperism, where professional beggars are so numerous that government laws are necessary to remove or control them. A population of mendicants naturally results in a criminal community, and all countries containing this element have endeavored to remove this evil by legislation. There were beggars in biblical times. As early as 1351 France was compelled to pass laws against "Lazy persons, truants, and able-bodied beggars." Laws were passed in England on this subject as early as the time of Henry VIII. Mendicity has been found to exist to a greater extent in South European countries than elsewhere, and in Spain and Italy the professional beggar has been one of the greatest evils, the standard of prosperity, morality, and intelligence declining as mendicity increased.

According to the census statistics of 1900 there were 91,227 professional beggars in Spain, of whom 51,948 were women. In some of the cities beggars are licensed to carry on their trade. Seeking alms is recognized as a legitimate business, and the municipality demands a percentage upon the collections. Seville is the only city in the kingdom which forbids begging upon the streets. In some of the other towns beggars are allowed to come out and ply their trade one day in the week, perhaps Friday or Sunday, when the streets swarm with them as they go from house to house, sometimes on horseback, and it is said sometimes in carriages also. In Madrid there is no restriction and no license, and the streets are lined with them.

In 1903 the Spanish government passed a new law which aims to suppress vagrancy and begging, especially in the case of young children. It enacts that the parents and guardians of minors arrested for begging or wandering and sleeping on the highways and the public thoroughfares shall be liable to punishment by fines or terms of from 1 to 15 days' imprisonment. Heavier fines or from 15 to 30 days of imprisonment are imposed on parents and guardians who ill-treat children in order to make them beg, or who sell them to others for the purpose of begging. All persons convicted will forfeit their right to have the custody of the children for two years or more, at the discretion of the courts and authorities, who will place the minors in proper establishments for their support and education, until it is possible to restore them to their parents. This law, though introduced by the Minister of the Interior, was prepared by the Social Reform Committee, and drafted by a distinguished professor at the Madrid University, Senator Santa Maria de Paredes, formerly tutor in public law and economics to the king.

In Mexico, both Indians and native Mexicans to the number of thousands make up the army of professional beggars, and Mexico appears to have no laws to regulate them. In the Mexican cities and at fairs and festivals the mendicants are to be seen in astonishing variety; some maimed, some blind, and able-bodied fellows with most artistic «make-ups» of tattered garments and unkempt hair and beards. Some of these stand before one silently with a dumb appealing look in their eyes. Others kneel in the midst of the way, and fill the air with their doleful stereotyped appeals for charity. These beggars are humbugs after the manner of their kind the world over.

In the United States, where labor is in greater demand and better paid than abroad, there seems to be no excuse for mendicity, and yet there are many professional beggars here, largely able-bodied foreigners. The laws of Massachusetts, New York, and some other States make vagrancy a crime, and authorize the commitment of tramps to the workhouse, house of correction and common jail for varying periods. In the Atlantic coast States the evil is developing with alarming rapidity and demands more stringent treatment than heretofore.

New York city is a beggars' paradise. Between 6,000 and 8,000 professional mendicants make that city their home. Every other city in the United States suffers from the professional beggar, but not to the same extent as New York. The outdoor officer of the Charity Organization Society says that mendicants from all parts of the country flock to New York because the indiscriminate giving there is so common. Cities and States ship their beggar population to New York. About 10 per cent of these beggars are women.

Through the winter the arrests of professional beggars in New York average 200 a month. For the first offense the beggar gets five days' imprisonment, and for the second, third, and so on he should receive 40, 80, 160 days, and finally six months. But as he comes up under a different name each time, five days is his usual sentence. At the end of that short period he is preying on the community again.

Men'dicant Orders. See MONASTICISM.

Mendive, mān-dē'vā, **Rafael Maria de,** Cuban poet: b. Havana, Cuba, 24 Oct. 1821; d. Matanzas, Cuba, 1886. His first collection of poems (1847), entitled 'Passion-Flowers,' is widely popular. Banished in 1869, he lived alternately in New York and Nassau, writing legends and stories in verse. He was one of the most notable of Spanish-American poets; and many of his verses received English, French, and Italian translations.

Mendocino. See CAPE MENDOCINO.

Mendo'ta Lake. See FOUR LAKES.

Mendoza, mĕn-dō'thā, **Antonio de,** Spanish administrator: b. about 1485; d. Lima, Peru, 21 July 1552. In 1535 he was appointed by the Emperor Charles V., with whom he was in great personal favor, viceroy of New Spain (Mexico), being the first of 64 viceroys, with the longest administration, and that which shows the best record, in the history of that provincial government. He made many reforms, especially in relieving the oppressed natives; developed agriculture and mining; established the first Mexican mint; founded the first college; and introduced the first printing-press. In 1551 he became viceroy of Peru, where he caused to be prepared a code of laws that has been the basis of the colonial and, to a large extent, of the present legal system of the republic. It was under Mendoza's administration in Mexico that Francisco Vasquez de Coronado (q.v.) undertook his famous exploring expedition.

Mendoza, Diego Hurtado, dē-ā'go hoor-tä'do, Spanish author and statesman, great-grandson of the Marques de Santillana (q.v.): b. Granada 1503; d. Madrid 15 April 1575. He was educated, as a younger son, for the Church, but, after studying Arabic at Granada and the humanities at Salamanca, entered the army, and in 1525 fought at Pavia. He acted as Charles V.'s ambassador to England in 1537, to Venice in 1538, to the Council of Trent in 1545, and to the Papal See in 1547, when he became governor of Siena. With Philip II. he quarreled, and in 1564 was interned in Granada, only returning to court in 1574, soon before his death. To his stay in Italy was due his influence in making the Spanish lyric thoroughly Italianate; and from Italy he brought an unusual knowledge of the classics as well as a fine collection of Greek manuscripts. Mendoza also perfected the Spanish poetic epistle. The famous romance, 'Lazarillo de Tormes,' has been ascribed to him. But his greatest work is his history of the Moorish insurrection, 'Guerra de Granada,' a model of historical impartiality, and on a theme for which knowledge of Arabic peculiarly fitted him. So impartial was this work that it was not published complete for many years, and even now a good edition is a desideratum. Consult the biography in German by Fesenmair (1882).

Mendoza, Pedro de, Spanish explorer in American, founder of Buenos Ayres: b. Guadix, Granada, about 1487; d. at sea 1537. He was a favorite of Charles V.; fought bravely in Italy; and in April 1535 left Spain with 12 ships and 800 men, sailed up the Plata River, and founded the city then called «Nuestra Señora de Buenos Ayres.» His further movements were unfortunate; Indians and disease attacked his men, three fourths of whom, including his own brother, were lost. The natives captured and burned the city, and Mendoza, rescued none too soon by his brother, who came with reinforcements, set sail for home. But his health and reason were undermined and he died on board ship.

Mendoza, Argentina, a province in the western part, on the eastern slope of the Andes Mountains; area, 54,000 square miles. Mount Aconcagua, 22,427 feet, is on the northwestern boundary. The western part of the province is mountainous, the eastern part pampa land and fertile where watered by the streams or by irrigation. It is rich in minerals, especially silver and copper. Coal and petroleum abound. Grapes grow luxuriantly and a large quantity of wine is shipped to the other provinces. Cattle, hides, and wool are the chief exports. Wheat and corn are increasing in importance. Pop. 118,000.

Mendoza, Argentina, city, capital of the province of Mendoza; at the base of the Andes, on the eastern side of the mountains, on the railroad which extends from Buenos Ayres to Valparaiso, Chile; about 600 miles west by north from Buenos Ayres and 165 miles east of Valparaiso. It is about 2,400 feet above the sea. The city was founded in 1559. In 1861 it suffered from an earthquake which killed about 10,000 people and destroyed a great part of the city. It is the seat of two national normal schools, a national college, and an agricultural institute. Pop. 20,000.

Mene, mĕ̄'nē (numbered); **Tekel** (weighed); **Upharsin** (divided), the Chaldee words traced on the wall at Belshazzar's feast, and significant of his impending doom (Dan. v.). The astrologers could not read them, because they were written in antique Hebrew characters, but Daniel understood their awful meaning; and the same night witnessed their fulfilment.

Menedemus, founder of the school of philosophy called Eretrian from his native city Eretria: b. about 351, d. about 277 B.C. Traditions vary as to whether he turned to philosophy under the influence of Plato, or under that of Stilpo of Megara, but his tenets seem to have most resembled those of the Megarian school.

Menelaus, mĕn-ē-lă̄'ŭs, in Greek legendary history the son or grandson of Atreus, and brother of Agamemnon. From his father-in-law Tyndareus, whose daughter Helen he married, he received the kingdom of Sparta or Lacedæmon. Paris, son of Priam, king of Troy, having carried off his wife Helen with a part of his treasures, and some female slaves, and conveyed them to Troy, Menelaus, accompanied by Ulysses, went thither to demand the restitution of his wife and property, and this being refused, he summoned the Greek princes to revenge the affront according to their promise. After the conquest of Troy Menelaus took Helen to return with her to his native land. Eight years he wandered before he reached home. On the island of Pharos he surprised Proteus asleep and compelled him to disclose the means which he must take to reach home.

Men'elek, or **Menilek,** emperor of Abyssinia: b. Ankobar 17 July 1844; d. 1910. His father, crown-prince of Shoa, died in 1855; the boy then fell into the hands of Theodore, his father's rival for the throne, who kept him under guard in Gojam, and attempted to win his allegiance by marrying him to one of his own daughters and giving him the high title of Dejasmatch. Menelek escaped to Shoa in 1865, raised an army, made himself king, and in 1889 succeeded John II. as negus of Abyssinia. For this place he claimed a hereditary right because of his descent from Balkis, queen of Sheba, and Solomon. He trained his army partly after European methods; protested against Italy's claim to a protectorate; defeated the Italian force at Adowa in 1896, but chivalrously permitted his captives to go away unharmed; and by the Peace of Addis Abeba (26 Oct. 1896) won Italy's acquiescence in his independence. In 1898 he came to an agreement with Great Britain, by which his boundaries are left intact; and in October 1903 received with much cordiality an envoy of the United States, who came to proffer Menelek a commercial treaty and to invite him to the St. Louis Exposition.

Menendez de Avilés y Marquez, mā-nĕn'-dĕth dā ā-vē-lās' ē mär'kĕth, **Pedro,** Spanish captain, founder of the city of Saint Augustine, Fla.: b. Aviles, Asturia, 1519; d. Santander 17 Sept. 1574. In June 1565 he sailed with 1,500 men in 19 vessels to dislodge the French in Florida; landed there 28 August; and 6 September began a fort, the nucleus of the present town. He attacked the French garrison at Fort Caroline, during the absence of part of the force, which had set out to attack him but was storm-stayed and finally wrecked. Menendez slaughtered the remnant at the fort and those saved from shipwreck. He returned to Spain in 1567; visited America twice again, strengthening St. Augustine in 1568, and in 1570 sending a party of colonists to the Chesapeake and up the Rappahannock, where they were massacred by the natives; and was recalled to Spain shortly before his death. During the last two years of his life he was governor of Cuba.

Menendez y Pelayo, ē pā-lă'yō, **Marcelino,** Spanish critic: b. Santander 3 Nov. 1856. He was educated at Madrid and Paris; in 1878 became professor of philosophy and letters in Madrid; three years later was elected to the Spanish Academy; and in the late '90's became director of the Biblioteca Nacional. He is an ardent admirer of the classics and is theologically and politically a thoroughly strict and conservative Catholic. His style is wonderfully finished and elegant, and his matter well handled. He wrote: 'Estudios criticos sobre Escritores Montañeses' (1876); 'Horacio en España' (1877); 'Historia de los Heterodoxos Españoles' (1880–1); 'Calderon y su Teatro' (1881); 'Odas, Epistolas y Tragedias' (1883); 'Historia de las Ideas estéticas en España' (1884–91).

Menes, mē'nēz, according to Egyptian traditions, the first king of Egypt. Herodotus relates that he was the founder of Memphis, which he built on a piece of ground which he had recovered from the Nile by altering the river's course. According to Diodorus, Menes introduced into Egypt the worship of the gods, as well as a more elegant style of living. He has been identified by some with the Mizraim mentioned in Gen. x. 6. A tomb supposed to be that of Menes was discovered near Nakâdeh by De Morgan in 1897. See Egypt.

Meng-Tse, mĕng-tsĕ'. See Mencius.

Mengs, Anton Raphael, German painter: b. Aussig, Bohemia, 12 March 1728; d. Rome 29 June 1779. In early childhood his father, Ismail Mengs, a miniature painter of little talent, who was settled at Dresden, took him in hand to make a painter of him, and in 1741 carried him to Rome and set him to study the antique, and to copy Michelangelo and Raphael. He was compelled to do a certain task in painting every day; his day's work subjected to severe criticism; and he was even punished if it was not satisfactory. From this constant practice he early gained skill as an artist, and when he returned to Dresden his talent and proficiency were at once recognized by August III., who appointed him court painter, and gave him permission to return to Rome. At Rome he attended the Academy, and in 1748 produced a large and elaborate composition, ‘The Holy Family,’ taking as model for the Mother of Jesus a beautiful peasant girl, whom he afterward married. On his return to Dresden he was commissioned to paint an altar-piece, ‘The Ascension of Christ,’ for the high altar of the Chapel Royal, and was given permission to return to Rome for the purpose of doing so. A new Academy of Painting having been opened in the Capitol he was appointed director, and painted for the Celestines the ceiling of their church, San Eusebio, for Cardinal Albani the ‘Parnassus’ in the ceiling of his villa, and several oil paintings, including ‘Cleopatra,’ ‘The Holy Family,’ and ‘The Magdalen,’ for private persons. When King Charles III. of Spain summoned him to Madrid he executed for him in fresco there ‘The Assembly of the Gods’ and ‘The Descent from the Cross’; he also completed the altar-piece for Dresden. He returned to Italy in 1769, stayed eight months at Florence and painted for the pope a ceiling fresco for the Vatican library. In 1772 he went to Spain and produced for the king the fresco ‘Apotheosis of Trajan,’ his finest work, but returned to Rome in 1775. On his death the Cavalier d'Azara set up a statue to him and Catherine II. of Russia raised a splendid tomb for him in St. Peter's. He was certainly one of the most important painters of his day, and if he possessed none of the free and living originality of genius he was a master of noble composition and design. He was catholic in taste, and eclectic in style, drawing inspiration from the antique, as well as imitating Raphael, Titian, and Correggio, whose styles he tried to blend. Consult: Woermann, ‘Ismail und Raphael Mengs’ in the ‘Zeitschrift für bildende Kunst,’ Number 5, 1893.

Menha'den, a species of fish (*Brevoortia tyrannus*) of the herring family (*Clupeidæ*). Owing to the very large number of local names applied to this species much confusion concerning its identity and distribution exists in the minds of fishermen and others having only an unscientific knowledge of fishes. The name which heads this article is used chiefly in southern New England, and has become the book name of the species. North of Cape Cod it is the pogy, or occasionally the hard-head; in New York and New Jersey mossbunker, or some variation, as bunker or marshbunker, are the favorite names; the fishermen of Delaware and Chesapeake Bays know it as the bay alewife, and in the latter region and southward also as the bug-fish or bug-head, for a reason indicated below; still farther south it becomes the fat-back, and so on through a list of upward of 30 names, each of which has its advocates as the correct one. The specific name *tyrannus* does not refer to any quality of disposition of the menhaden, but was suggested by an association in the mind of the describer between a parasitic crustacean (*Olencira prægustator*) living in the mouth of the fish and the foretasters of the Roman emperors. Like some other pelagic and migratory fishes the menhaden is exceedingly irregular in its movements and variable in abundance and distribution from year to year, but its general range is from Nova Scotia to Brazil and oceanward, so far as observed, to the Gulf Stream. In spring it approaches the coasts and extends northward with the alewives and other species, probably for the purpose of spawning in brackish water, though little is actually known of its spawning habits. In winter Cape Hatteras marks the northern limit of its abundance. The menhaden swims in compact schools of large size, the movements of which at the surface, or sunken to a greater depth, are extremely irregular. Their seeming capriciousness has, however, been recently explained by a study of their food. Their gill arches bear a complicated and efficient system of filters, through which a large volume of water is strained as the fishes swim about with opened mouths and distended gill covers. Great quantities of minute animal and vegetable organisms are thus secured and swallowed.

From the other herrings the menhaden is readily distinguished by its very large head, large mouth, complex gill strainers and crenulated scales. The body is deep, the fins small, the mouth toothless and the color bluish and silvery, with one large and several small black spots.

Of all Atlantic coast fishes this is by far the most abundant, and, notwithstanding the incalculable millions annually destroyed by man and the predaceous fishes, birds and cetaceans, its numbers have shown no certain and permanent diminution, except in partially enclosed waters. Owing to its strong oily taste and extreme bonyness its value as human food is very slight, but as furnishing food for other fishes, as bait and for the manufacture of oil, fertilizer and other products, it has a very great economic importance. Large companies control its capture for the latter purposes and, besides pound nets, utilize many steamers provided with purse seines and derricks by means of which entire schools are taken at a haul and lifted on deck. The oil is extracted and the solid parts ground up for fertilizer at shore factories. The product varies from year to year, but the total weight of fish taken runs into the hundreds of million pounds. The following statistics are for the year 1888: Capital invested, $2,239,755; number of factories, 55; number of steamers, 55; sailing vessels, 66; persons employed, 3,229; menhaden handled, 609,715,930; total value of products, $1,655,920; oil manufactured, 2,818,097 gallons; fertilizer prepared, 48,344 tons. Consult Goode, ‘History of the Menhaden,’ Rep. U. S. Fish Commission, 1879.

Men'hirs, elongated, rough-hewn monoliths standing with one end in the ground. They are found of various sizes, from about 6 to as much as 67 feet high, the latter being the height of that at Locmariaquer in Brittany. Singular superstitions naturally attach to some of them. See Standing Stones.

Meningitis, inflammation of a membrane, especially of the meninges or membranes of the brain and spinal cord. It is very rarely a primary condition, and in any of its forms may be confounded with typhoid fever, mania, etc. Inflammation of the meninges is generally confined to the pia mater and the arachnoid membrane (leptomeningitis), but may extend to the dura mater. Pachymeningitis, inflammation alone or chiefly of the dura mater, may extend to the other membranes. Inflammation of the cerebral meninges is cerebral meningitis; of the spinal meninges, spinal meningitis; of those of the brain and spinal cord, cerebro-spinal meningitis. Ascending meningitis is a meningitis ascending from the lower part of the spinal cord.

Pachymeningitis is comparatively rare. The form involving the external surface of the dura mater results from blows or other injuries, and from osseous growths. There may be no well-defined symptoms, but usually is local headache and tenderness on pressure. If the dura mater, which is normally free, is bound to the skull by fibrous exudation, and especially if pus forms and hemorrhages occur, there are symptoms of pressure. Inflammation of the internal portion of the dura mater may result from the extension of inflammation from adjacent parts, such as the ear, the frontal or the ethmoidal sinus; or it may attend cases of pernicious anæmia, chronic syphilis, tuberculosis, and chronic wasting diseases. It occurs chiefly in old age, but has been seen in children. There are fibrinous deposits and extravasations of blood in cysts (hæmatoma), and occasionally pus forms. The brain is anæmic, sometimes softened. The symptoms are those of irritation — convulsions, vomiting, contracted pupils, a slow irregular pulse, etc.,— and those of compression or pressure — coma, etc. Pachymeningitis is usually fatal.

Cerebral meningitis (simple or cerebral meningitis), in the acute form, is not common, and is most apt to occur in men engaged in hard mental pursuits. It may be caused by injuries, by sunstroke, by spirituous liquors, etc., and is very dangerous, death usually occurring in from three to eight days. The brain is reddened and covered more or less with pus and coagulated fibrin or lymph, and its superficial layer is softened. There is almost always watery effusion into the brain-cavities. The symptoms are those of three stages: (1) headache; (2) delirium; (3) coma. At first there may be slight fever, some photophobia, frequency and irregularity of the pulse, and some contraction of the pupils. There is a disposition to vomit, a slowness in movements of the bowels, and often hyperæsthesia. Then comes delirium, which may or may not be active; the patient talks much, and tries to get out of bed; does not obey readily. There is more or less trembling of the limbs, with difficulty in moving them. One pupil is likely to be dilated. Sometimes strabismus occurs; the pulse is very irregular; and paralysis begins. Then follows coma, loss of sense, sensation, and of voluntary motion; there is sighing, the pulse is frequent and weak, the pupils do not respond readily to light, and the capillaries of the skin and eye are congested. Recovery from this disease cannot occur after the period of coma begins.

Sub-acute or chronic cerebral meningitis is a secondary disease, sometimes associated with chronic syphilis, Bright's disease, alcoholism, etc., though the cause is not always ascertained. The lesions are similar to those of acute meningitis, but less pronounced. There is less of serum and pus, and the exudated fibrin is more circumscribed. The symptoms are insidious and vague. Headache, vomiting, and photophobia are rare. The slight delirium is followed, it may be, by somnolency, irregular pulse, strabismus, and sighing respiration. With coma the pulse is rapid, 120 or more, and the patient dies as in acute meningitis.

Tubercular meningitis (a form of cerebral meningitis), also known as acute hydrocephalous granular meningitis and basilar meningitis, is an acute tubercular inflammation of the pia mater, caused by a deposit of miliary granules over the surface of the brain, but most numerous at the base, in the track of the cerebral vessels, and in their sheaths. There is a noticeable vascularity, especially in the ventricles. The pia mater is thickened and opaque and covered with a semi-purulent exudation. Serum fills the ventricles and foramina, pressing upon the convolutions, and assists in softening portions of the brain. The lesions in this disease are rarely limited to the brain; tubercles are found in other organs, especially the lungs. The disease is a phase of that protean malady, tuberculosis, though the cerebral lesions may first be noticed. The primary causes are a hereditary diathesis (scrofulous or tuberculous), foci of caseous degeneration in some organ, a suppurating joint, or a scrofulous inflammation of bone. Exciting causes are impure air, exposure, unwholesome food, bad drainage, blows upon the head, excessive study and worry, etc. Though the disease is essentially a disease of early life (from nine months to ten years), it also attacks adults. Most of those affected die in from two to six weeks. The symptoms may be classed under three heads: (1) obscure symptoms; (2) those of rapid development; (3) those of coma. There are seen listlessness, loss of appetite, occasional vomiting, slowness of the bowels, and somewhat frequent pulse. Sometimes there is headache, a remittent form of fever, and then rapid development of diagnostic symptoms. The patient talks a good deal. There are irregularity of the pupils and pulse, a sharp "cephalic" cry, severe headache, insensibility to light and sound, grinding of the teeth, a flushed face in paroxysms, usually before convulsions, rolling and drawing back of the head, urine scanty and high-colored, oscillation of the eyes, obstinate constipation, etc. With coma comes strabismus; the pupils do not contract under the influence of light, but will contract and expand when the bowels rumble or the patient is moved. There are convulsions, paralysis, and automatic movements of the feet and hands, it may be for hours. The thumb may be turned in. There is a hollowed abdomen (boat-shaped), and congestion of the eyes, a puriform secretion sticking the eyelids together; involuntary discharge of bowels and bladder, are common. For treatment of this affection place patient in bed, in a quiet room; give easily digested food; apply an ice-cap to the head and warmth to the feet. Further treatment should be in the hands of a physician. Much can be done by parents and guardians to prevent the onset, by not developing the nervous system at the expense of the muscular and digestive systems. Precocious children are to be judiciously restrained, and outdoor life encouraged.

Spinal meningitis is not common; it is usually caused by injuries, is liable to occur in children with spina bifida, and is rarely amenable to treatment. Death occurs usually in from eight to ten days, either from extension of inflammation to the brain and pressure there by fluid, or from asphxyia due to spasms of the respiratory muscles. The lesions are similar to those of cerebral meningitis. The chief symptoms are pain in the spine and extremities, increased by movements of the body, great sensibility of the surface of the body, spasms of muscles, opisthotonos, and dyspnœa.

Cerebro-spinal meningitis, or spotted fever, usually more of a fever than an inflammation, is due to blood-poisoning, generally appears as an epidemic, and is very dangerous. Death frequently occurs in a few hours; recovery usually requires 30 or more days. The disease has spread over sections of this country two or three times, mainly in the winter and spring. One form is characterized by fever with no eruption; the other by fever and an eruption. The disease has been confounded with typhus and typhoid fever. The symptoms are a chill or chilliness, followed by nausea and vomiting, fever, violent headache, sometimes with pain down the spinal column, great prostration, vertigo, tetanic rigidity of muscles, delirium, and other symptoms of meningeal irritation, followed more or less rapidly by those of coma. When there is an eruption it usually appears early, and consists of dark blotches, from the size of a pinhead to that of a nickel, and is not marked on the extremities.

Where death occurs within 12 hours from the time of attack only a congestion of blood-vessels of the brain and, it may be, of the spinal cord, is generally found. Almost always there is lymph or pus beneath the pia mater, and sometimes serous effusion in the pleura, pericardium, or peritoneum. The blood undergoes a change, ecchymoses are found sometimes in the muscles, or in connection with the pericardium or pleura. The most important thing in treatment is the production of free perspiration, with rest in bed. The use of blisters, etc., should be left to the physician.

Menippus, mĕ-nĭp'ŭs, Greek cynic philosopher, a native of Gadara in Palestine, and supposed to have flourished about 60 B.C. His writings were chiefly of a satirical kind. Lucian styles him «the most snarling of cynics,» and in two or three of his dialogues introduces him as the vehicle of his own sarcasms. It appears that his satires were composed in verse and prose, on which account those of Varro were denominated Menippean, and for the same reason the name of Satire Ménippée was given in France to the celebrated piece written against the League and Philip II. of Spain, its head. His writings are lost.

Men'ken, Adah Isaacs (originally DOLORES ADIOS FUERTES), American actress: b. near New Orleans, La., 15 June 1835; d. Paris, France, 10 Aug. 1868. Making her début with her sister as danseuses, at the New Orleans French Opera House, she was received with marked favor and visited Cuba, Texas, and Mexico. On her return to New Orleans, she published a volume of verse and taught French and Latin at a girls' academy in that city. In 1858 she appeared in ‘Fazio’ in New Orleans, and went to England in 1863–4, assuming the role of «Mazeppa» at Astley's which won her popularity. On 30 Dec. 1866 she played in Paris for 100 nights, and later in Vienna and London. Her last appearance was in Paris in May 1868. She was famous for her marriages and divorces; Alexander I. Menken, John C. Heenan, J. H. Newell, and James Barcley being her successive husbands.

Menno Simons, Dutch religious reformer: b. Witmarsum, Friesland, 1492; d. Oldesloe, Holstein, 13 Jan. 1561. He was ordained priest in the Roman Catholic Church and took pastoral work in the village of Pingium (1524), and from a study of the New Testament, undertaken (1530) to solve his doubts about transubstantiation, he was induced to become an evangelical preacher and finally left the church of his ordination. The martyrdom of Sicke Snyder at Leeuwarden for Anabaptism impelled him to consider the Scriptural grounds for infant baptism. He was finally converted to the cause of the Anabaptists, but never sympathized with the excesses of Münzer and wrote a diatribe against John of Leyden (q.v.) (1535). In 1537 at the request of a number of Anabaptists of Groningen he assumed the functions of an Anabaptist preacher and exercised, by his moderation, a most salutary influence over his fellow ministers. He now married, his change in faith having superseded his vow of celibacy, and began to travel as an evangelist not only in Friesland but throughout Holland and Germany as far as to Livonia. Being persecuted from place to place he finally settled in Oldesloe in Holstein, where he closed his ministry with the consciousness of having founded a large and flourishing sect, whose subsequent history is related under the title Mennonites (q.v.)

Views of Menno Simons.— Menno was rather a preacher of a system of personal sanctity than either a dogmatist or a violent fanatic like some of the Anabaptists. He was a man of pure moral and devotional enthusiasm, whose account of his own conversion reads like a passage from the ‘Confessions’ of Augustine. He sums up the results of his labors as consisting in the conversion and recovery of the wicked. Yet he formulated a somewhat vague profession of faith. He believed in the divinity of Christ, who was born on earth *in* Mary, that is, without taking upon him human flesh and blood. He rejected infant baptism, and baptized those only who made a personal profession of faith in Christ. He particularly emphasized the power of excommunication possessed by the Church, without which «the spiritual Kingdom of God on earth cannot,» he said, «exist in purity and piety.» He believed in the coming millennium (q.v.); he excluded civil magistrates from church membership on the ground that the church was a theocracy whose magistrates were the ministers. He declared that war and all taking and administering of oaths were unlawful, and regarded human science as useless, even pernicious to a Christian. These decrees, however, as modified by the explanations of Menno, differed little from those generally promulgated by the Reformed bodies of his day. His principal teaching was of a moral and practical character. He was a meek, humble, noble-minded man, carried away with the spirit of his times, encouraging all that was good and pure among his followers, and sternly rebuking the guilty. The best edition of his work is ‘Opera Omnia Theologica of al de Godgeleerde werken vann Menno Simonis’ (1681). Consult: Harder, ‘Leben Menno Simons’ (1846); Roosen, ‘Menno Simons den evangelischen Mennonitengemeinden geschildert’ (1848).

Mennonites, members of a Christian sect founded by Menno Simons (q.v.). The Anabaptists of the Netherlands, who were Menno's followers, did not call themselves Mennonites until 1536, when they organized and established their union. This union was, however, early disturbed by the complications springing from the most impracticable of their disciplinary canons, namely, that on the subject of excommunication. One section of the church wished for the strictest enforcement of the rule, and were called *die Feinen,* the Fine, and generally known as Flemings or Flandrians, from their province; these were the rigid literalists of discipline. The others, *die Groben,* the Coarse, or Waterlanders, so called from the district of Waterland, which they occupied, were milder in their interpretation of the canon. These latter were ultimately expelled from the body. Another schism took place at Amsterdam in 1664, between the Remonstrants (q.v.) and the orthodox party. By the year 1811 these breaches were all healed and a closer fellowship than ever bound the Mennonites together on the basis of a belief in baptism by infusion, for which adults only were eligible. Their disciplinary canon, however, modified by time or expediency, rests on the principle that the kingdom of Christ established on earth is a visible church, or community, into which the holy and just alone are to be admitted; and which is exempt from all civil institutions and the restrictions of civil law. The history of the spread of this strict and exclusive sect is interesting.

The Mennonites in Germany and Prussia.— The sect quickly overflowed the boundaries of the Netherlands, and in the 17th century its representatives were numerous in Germany, being counted at 70,000 in Moravia alone. Wherever they settled their Dutch thrift and industry caused the wilderness to blossom as a rose. Ferdinand II. expelled them in 1622; in 1730 and 1732 their refusal to serve in the army brought on them the threat of expatriation. In 1789 they were forbidden to become land-owners, but their numbers in all Germany to-day are estimated at 18,000.

The Mennonites in Russia.— Catharine II. learning of their excellent qualities as colonists, invited the Mennonites to Russia in 1786 and three years later 228 families settled there. These were followed by many others. They were guaranteed safety to life and property, freedom of worship and a grant of land to each family, exemption from taxes and, among other privileges, exemption from military service in perpetuity. Mennonite immigration continued up to 1817. Since then these sectaries received other tokens of favor and good-will from the imperial government. But in the last half of the 19th century the condition of things changed. An edict addressed to all colonists in the empire announced that in 10 years the stipulation as to their exemption from military service would expire. The Mennonites were allowed 10 years to leave Russia, and after making inquiries as to advisability of crossing the Atlantic, they decided to leave Europe, and the United States was considered preferable to Canada as a place of settlement. Immediately $20,000 was raised for the expenses of a commission of 12 men who should spy out the land and choose the most favorable spot for a Mennonite settlement. The western prairies and some of the Southern States were selected as most suitable, and large purchases of land were made.

The Mennonites in the United States.— Mennonites had settled in the United States as early as 1683. William Penn was struck by their resemblance in social habits to the Quakers, and invited them to settle in Pennsylvania. His request was accepted, and the first party of Mennonite immigrants had in half a century from their arrival increased to 500 families. They were most numerous in Germantown and Lancaster County. Spreading to Maryland, Ohio, Indiana, and New York, they became diffused over every quarter of the Union and of Canada, though most thickly settled in Pennsylvania, Ohio, Maryland, and Virginia. It is calculated that to-day they number 55,554 members, with 1,112 ministers and 673 churches. But the followers of Menno Simons since their departure from Europe have felt the liberty of this new environment, and are now cut up into no less than 12 separate and independent bodies. The oldest and largest of these is (1) the Mennonite Church, which includes about two fifths of the whole sect. It is most largely represented in Pennsylvania and Ohio, and has a publishing house at Elkhart, Ind., from which are issued four newspapers, one review and a great amount of Mennonite literature, historical, theological and educational. (2) The Bruederhoef Mennonite Church has five congregations, 352 members, and 9 ministers. They trace their origin to Jacob Huter, who was burned at the stake in Innsbruck, 1536, and they settled in the United States in 1874. (3) The Amish Mennonite Church, second in importance among the divisions of this sect, has 365 ministers, 124 churches, and upward of 13,000 members. It consists of the followers of Jacob Amen, who separated from the main body in Switzerland, 1620. (4) The old Amish Mennonite Church, which has 2,438 members, 75 ministers, and 25 churches, adheres strictly to the ancient customs and ordinances of the sect and rejects all innovations. (5) The Apostolic Mennonite Church, a branch which came to the United States at the end of the first half of the 19th century, has two churches and about 200 members. (6) The Reformed Mennonite Church, started in 1812 under John Herr with the purpose of reviving the primitive customs of the sect. It consists of about 1,600 members and 43 preachers. (7) The General Conference Mennonite Church originated as a sequel to an attack made on a minister, John Oberholtzer, in Pennsylvania, who in 1848 was charged with introducing innovations. The followers of Oberholtzer formed this branch under him, and it now numbers about 10,000 members, and 128 preachers. (8) The Church of God in Christ started forth in 1859, under a missionary, John Haldeman. It adheres to the original doctrine and discipline and comprises 449 members. (9) The Old or Wislar Mennonites sprang from a division or dispute consequent on the introduction of Sunday Schools and evening meetings in the Mennonite Church in Indiana 1870. It comprehends 603 members and 15 churches. (10) Die Bundes Conferenz der Mennoniten Brüdergemeinde originated in Russia 1840 and came to the United States 1873. It adheres to the practice of baptism by immersion, emphasizes the necessity of conversion as provable by plain evidence; and promotes foreign missions, notably in China, Africa, and India. Members 2,000, ministers 42. (11) The Defenseless Mennonites also lay stress on visible conversion. They are a branch of the Amish Mennonites. Members 1,200, ministers 20. (12) The Church of the Mennonite Brethren was organized in 1880. It is the most liberal of all the branches of the sect; its adherents are open communionists and indifferent as to the form of baptism. Consult: Martin, 'The Mennonites' (1883); and Krehbiel, 'The History of the General Conference of Mennonites of North America' (1895).

Menobran'chus, a genus of tailed amphibians, more properly termed *Necturus,* the single known species of which is the North American mud-puppy (q.v.).

Menocal, Aniceto Garcia, American civil engineer: b. Cuba 1 Sept. 1836; d. 20 July 1908. He was educated in Havana and was graduated from the Rensselaer Polytechnic Institute in 1862. In 1863–9 he was engaged as sub-chief engineer of the Havana waterworks and in 1870 returned to New York, where he was two years in the engineering of the waterworks department. He was chief engineer of all the surveys made for the isthmian canal by the United States government and was sent to Paris in 1879 as member of the Canal Congress. He furnished the estimates of the cost of the canal and was a member of the boards for selecting coaling stations in the Philippines, Porto Rico, and on the coast of Liberia, Africa. He was a member of several scientific societies and published many of his official reports, etc.

Menominee, the French Folles Avoines, a tribe of North American Indians of Algonquian stock, formerly known in upper Michigan and Wisconsin, along the Menominee River and Green Bay, and ranging west to the Mississippi, and south to the Fox River. Their name signifying "wild-rice men," hence the French translation, is derived from their use as a staple food of the abundant wild rice of the region. Their descendants in 1901 numbering 1,390, civilized and Roman Catholics, inhabit the Green Bay Reservation, Wisconsin.

Menominee, mė nŏm'ĭ-nē, Mich., city, county-seat of Menominee County; at the mouth of Menominee River, on Green Bay, and on the Chicago, M. & St. P., the Wisconsin & M., and the Chicago & N. W. R.R.'s; opposite Marinette (q.v.) and about 50 miles northeast of Green Bay, Wis. The first settlement was made in 1799 by Louis Chappieu, a French fur trader. The first lumber mill was built in 1832, but the town was not incorporated until 1883. It is situated in an extensive lumbering region, and it is one of the largest lumber-shipping ports on the Great Lakes. Its chief industries are connected with the lumbering interests; the principal manufactures are lumber in all forms, paper, shoes, boxes, machinery, telephones, steam-boilers, beet-sugar, electrical machinery, and lumber-camp outfits. The city has a fine high school, public and parish schools, and a public library which contains about 5,000 volumes. It has Saint Joseph's Hospital, the county buildings, and several fine churches. The government is vested in a mayor and council elected annually. The city treasurer and the justice of the peace are elected by the people; the other administrative officers are chosen by the mayor and council. Pop. (1910) 10,507.

Menomonee, Wis., city, county-seat of Dunn County; on the Red Cedar River, and on the Chicago, St. P., M. & O., and the Chicago, M. & St. P. R.R.'s; about 68 miles east of Saint Paul, Minn. It is in an agricultural region and near the lumber section of the State. The chief manufactures are lumber, wagons, carriages, machinery, foundry products, brick, and flour. The trade is principally in lumber, flour, fur, brick, and wheat. Menomonee is the seat of the Stout Manual Training School (q.v.) and a normal training school. It has the Mabel Tainter Memorial library, which contains about 8,500 volumes. The Dunn County Asylum is near, but outside the city limits. Pop. (1910) 5,036.

Men'opause, the cessation of menstrual flow in women; climacteric; change of life. This epoch is reached generally between the 45th and 52d years, and is frequently marked by nervous disturbances. The power of child-bearing terminates at the menopause. See Climacteric; Menstruation, Disorders of.

Men'opome, a giant salamander of the genus *Cryptobranchus* (formerly *Menopoma*). See Hellbender.

Men'pes, Mortimer, English artist: b. Australia. He went to London when 19, studied at South Kensington; spent three years in Brittany at Pont Aven; traveled in Japan, where he learned something from Kyosai, in India, Burma and Cashmere, then through southern Europe, and in Mexico; and wherever he went continued his early experiments in color and his attempts to reproduce the atmosphere of various localities. Originally he used the color as dry as possible, then mixed it with petroleum, and finally used poppy-oil as a medium. He revived the lost art of printing in color from etched plates; made some excellent dry paint etchings, notably one of Hals' 'Archers of St. Adrian'; and published several volumes of pictures. His English house was made in the East, and is a wonderful piece of Oriental workmanship in gold and black.

Men'sa, or Mons, in astronomy, one of the 14 constellations which Lacaille discovered at the Cape of Good Hope. It is named from the mountain which is a conspicuous feature of the landscape at the Cape. The constellation is a very inconspicuous one near the South Pole, its brightest star being only of 5.3 magnitude.

Menstrua'tion, the discharge of the menses or bloody fluid from the female generative organs. In women it normally occurs at intervals of one lunar month, or 13 times a year (hence the use of the term *menses,* Latin plural of *mensis,* month). Its first appearance marks the stage of puberty, and is usually attended by definite changes — enlargement of the breasts, showing development of the mammary glands, growth of the ovaries, of the uterus and external genital organs, etc., and by other signs, physical and mental, of approaching womanhood and maturity. It usually begins, in temperate climes, between the 14th and 16th year, and continues its periodic recurrences until the menopause (q.v.) or final cessation of the discharge, which ordinarily arrives somewhere between the 45th and 52d years. The recurrent periods of its appearance, as well as their duration, vary with different persons, and not infrequently in the same individual; the variations, however, not always indicating abnormal or pathological causes. Menstruation is often at first, and in many persons throughout the catamenial age, attended by characteristic pains and symptoms, with physiological and psychological conditions of disturbance or depression, which sometimes call for special hygienic treatment. During pregnancy (with exceptional cases) there is no menstrual flow, its cessation being one of the earliest signs of conception. Observance of wholesome rules of exercise, rest, etc., helps to maintain normal conditions of body and mind, the reverse of which, owing to neglect of such rules, so often makes the menstrual function a visitation of dread and distress.

Disorders of Menstruation. — These include amenorrhœa, dysmenorrhœa, menorrhagia and metrorrhagia. Amenorrhœa is an absence of the menstrual flow from some cause other than pregnancy or the approach of the menopause (q.v.) or tardy establishment of the menstrual function. It is a symptom of anæmia (q.v.), or may be due to a constitutional condition such as profound nerve-fag or tuberculosis. Strychnine, iron, and ergot may be administered internally, or the physician may apply local treatment. (See DYSMENORRHŒA.) Menorrhagia is an abnormally profuse flow during the menstrual period, due to one of several conditions. If not checked by rest, a physician is necessary, as also in metrorrhagia, which is a sanguineous flow between the menstrual periods.

Mensuration. Mensuration is that branch of applied mathematics which treats of the metrical relations of geometric figures, in particular of the length of lines, the magnitude of plane and solid angles, the area of surfaces, and the volume of solids. The term is used both for the act and for the art of measuring geometric magnitudes. Mensuration is not usually treated as a separate branch of mathematics, but occurs as an integral part of various subjects, such as plane geometry, solid geometry, trigonometry, and integral calculus. For a discussion of the measurement of plane, diedral, spherical, and solid angles and of the relations between the sides and angles of a triangle (plane or spherical) the reader is referred to the article on TRIGONOMETRY. The present article will give formulas for lengths, areas, and volumes of the simpler and the regular figures and methods of approximation for the more complex or irregular figures.

The measure of a geometric magnitude is its ratio to a fixed magnitude of the same kind selected as the unit of measurement. Throughout this article the unit of area is assumed to be a square each side of which is equal to the unit of length, and the unit of volume is a cube whose edges are likewise of unit length. The purpose of a formula is to show how one of these numbers (ratios) may be found from certain others which are supposed to be known or obtainable. Thus formula (XIX) says that the ratio of the area of a circle to that of a square each side of which is a foot long (that is, the area of the circle measured in square feet) may be obtained by multiplying together the ratio of the circumference to the unit of length known as a foot, the ratio of the radius to the same unit of length, and the number $\frac{1}{2}$. It is important to recognize that in using any formula the units must all be of the same system. The number of acres in a field cannot be found directly from formula (X) by multiplying together the number of rods in two adjacent sides: this would give the number of square rods in the field. Nor is the number of gallons in a barrel given by formula (LXV) when the radii are measured in feet or in inches, but the number of cubic feet or cubic inches, as the case may be. In order to change any measure from one system of units to another, the following table may be found useful

To change		Multiply by	Inverse.
in.	to cm.	2.53998	.393704
ft.	to m.	.304797	3.28087
miles	to km.	1.60933	.621377
sq. in.	to sq. cm.	6.45148	.155003
sq. ft.	to sq. m.	.0929013	10.7641
sq. ft.	to acres.	.0000229568	43560.
sq. yds.	to acres.	.000206612	4840.
sq. miles	to acres.	640.	.0015625
cu. in.	to cu. cm.	16.3866	.0610254
cu. ft.	to litres.	28.3161	.0353156
cu. in.	to gallons.	.004329	231.
cu. cm.	to gallons.	.000264184	3785.235

[in. = inches, ft. = feet, yds. = yards, sq. = square, cu. = cubic, m. = metres, cm. = centimetres, km. = kilometres.]

For other multipliers see WEIGHTS AND MEASURES. The second column of figures serves to change the unit in the opposite way to that indicated by the rest of the table: thus to change meters to feet multiply the number of meters by 3.28087; for instance, 10 meters is equal to 32.8087 feet.

In many cases the computation of area or of volume may be accomplished most easily by mechanical means. For the measurement of the area of plane figures ingenious and effective instruments known as planimeters have been invented. Two historic instances are the finding by Galileo of an approximate value for the area of a cycloid by cutting it out of a sheet of copper and weighing the model, and the discovery by Archimedes of a fraud in Hiero's new crown through measuring its volume by submersing it in water and measuring the water displaced. To apply this last method, multiply the number of ounces of water by 1.73, or less accurately by $\frac{7}{4}$, and the result will be the number of cubic inches in the object; or, measure directly the volume of the water displaced.

LENGTH OF LINES.

Circle.—The *circumference* of a circle is equal to the diameter multiplied by

$$3.14159265358979323846264338328\ldots\ldots$$

This constant is usually denoted by the Greek letter π (pi) and is approximately equal to

$$3\tfrac{1}{7},\quad \tfrac{355}{113},\quad \text{or}\quad 3.1416.$$

Use the first if an error of one two-thousandth of the final result may be neglected, and the last if an error of one four-hundred-thousandth is negligible.

The above theorem may be written

$$\begin{aligned} l &= \pi d, \\ &= 2\pi r, \end{aligned} \qquad \text{(I)}$$

where l = length of circumference, d = diameter, and r = radius.

The length l of the arc AMB in Fig. 1, in which MD is the perpendicular at the middle point of the chord AB, AE is tangent to the circle at A or perpendicular to the radius OA, OE is perpendicular to AM, the chord of half the arc or the angle AOE is one fourth of the angle AOB, may be found by any one of the formulas

$$l=\frac{\pi}{180}dr,\quad \frac{\pi}{180}=\frac{1}{57}\quad \text{(error about } \tfrac{1}{200}\text{)} \tag{II}$$

$$l=c+\frac{8}{3}\frac{h^2}{c}, \tag{III}$$

$$l=2k+\tfrac{1}{3}(2k-c), \tag{IV}$$
$$=\tfrac{1}{3}(8k-c),$$

$$l=t+s, \tag{V}$$

in which d = number of degrees in the angle AOB, r = radius OA, c = chord AB, h = height MD, k = chord of half the arc AM, t = length

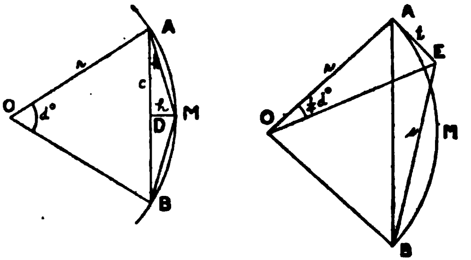

Fig. 1.

of AE, and s = length of BE. Formulas (III), (IV), and (V) are only approximate, the error being small only if the angle AOB or the ratio of h to c be small. Thus for an angle of $d=90°$ the arc is 1.5708 . . . , whereas formulas (III), (IV) and (V) give 1.576 . . , 1.5696 . . , 1.5732 . . , respectively.

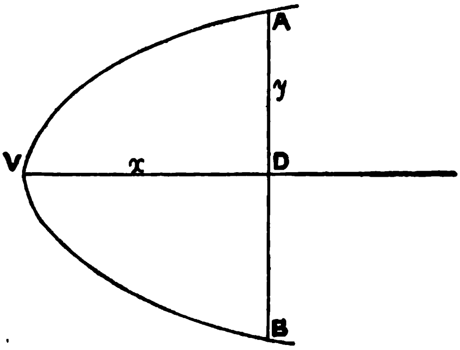

Fig. 2.

Parabola.—The length l of the arc AVB of the parabola in Fig. 2 is

$$l=\sqrt{y^2+4x^2}+\frac{y^2}{2x}\left(\log\frac{2x+\sqrt{y^2+4x^2}}{y}\right)\ldots, \tag{VI}$$

where $x=VD$, $y=AD$, and the logarithm is taken to the base e.

Ellipse.—The length l of the circumference $ABA'B'$ of ellipse in the next figure (Fig. 3), in which F and F' are the foci ($BF=BF'=OA$), is

$$l=2\pi a(1-\tfrac{1}{4}e^2-\tfrac{3}{64}e^4-\tfrac{5}{256}e^6\ldots), \tag{VII}$$

or approximately

$$l=\pi\sqrt{2(a^2+b^2)} \tag{VIII}$$
$$=4.443d;$$

where e is the eccentricity $\left(OF/OA=\frac{1}{a}\sqrt{a^2-b^2}\right)$; $a=OA$, one half the longest diameter; $b=OB$, one half the shortest diameter; $d=AB=\sqrt{a^2+b^2}$.

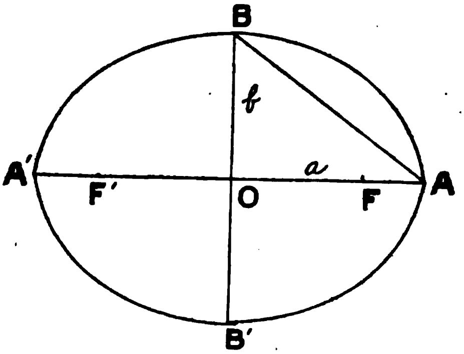

Fig. 3.

General Methods of Approximating the Length of Any Curved Line.—Divide the line into parts each of which differs but little from a small circular arc. Then each portion may be found by any one of the formulas (III), (IV), or (V). A convenient method for the use of formula (IV) is indicated by the following diagram (Fig. 4) and formula (IX). The only restrictions upon the location of the points 1, 2, 3, 4, . . . in addition to that given above is that the odd-numbered ones must be half-way between the others and that there should be an odd number of points in all.

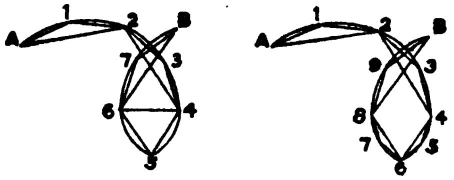

Fig. 4.

$$l=(\overline{A1}+\overline{12}+\overline{23}+\ldots)+\tfrac{1}{3}[(\overline{A1}+\overline{12}+\overline{23}+\ldots)$$
$$-(\overline{A2}+\overline{24}+\overline{46}+\ldots)]. \tag{IX}$$

Area of Plane Figures.

Rectangle.—The area a of a rectangle, the lengths of two adjacent sides of which are b and c respectively, is

$$a=bc. \tag{X}$$

Triangle.—The area a of the triangle ABC (Fig. 5) is

$$a=\tfrac{1}{2}hb, \tag{XI}$$

$$a=\tfrac{1}{2}bc\sin A, \tag{XII}$$

$$a=\sqrt{s(s-a')(s-b)(s-c)}, \tag{XIII}$$

or

$$a=\tfrac{1}{2}b^2\frac{\sin A\cdot\sin C}{\sin(A+C)}; \tag{XIV}$$

where a', b, c are the lengths of the sides BC, CA, AB, respectively; h is the perpendicular distance (height) of B from AC; s is one half of the sum of the sides: $s=\tfrac{1}{2}(a'+b+c)$.

If one angle of the triangle (say A) is a right angle, both formulas (XI) and (XII) simplify: namely, the area is one half the product of the two sides which enclose the right angle ($a=\frac{1}{2}bc$). For a simple method of finding the area of an equilateral triangle ($a'=b=c$) multiply the square on one side by $\frac{13}{30}$ ($a=\frac{13}{30}b^2$, approximately), see formula (XVIII).

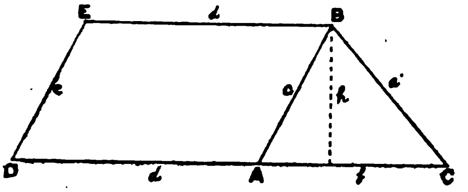

Fig. 5.

Parallelogram.—The area a of the parallelogram $ABED$ (Fig. 5) is

$$a=d\cdot h, \qquad \text{(XV)}$$

or

$$a=cd\sin D, \qquad \text{(XVI)}$$

where c and d are the lengths of two adjacent sides, D is the angle between them, and h is the perpendicular distance between the two parallel sides whose length is d.

Trapezoid.—The area a of the trapezoid $CBED$ (Fig. 5), any four-sided figure with two of the opposite sides (BE and DC) parallel, is

$$a=\tfrac{1}{2}h(d+e), \qquad \text{(XVII)}$$

where h is the perpendicular distance between the two parallel sides and d and e are the lengths of the parallel sides ($d=BE$, $e=DC$).

Regular Polygon.—The area a of a polygon bounded by n equal sides each of length s and having its n angles all equal is

$$a=s^2\times\frac{n\cot\dfrac{180^\circ}{n}}{4}. \qquad \text{(XVIII)}$$

The following table gives (approximately) the value of the multiplier in the simpler cases.

Name.	n	$\dfrac{n\cot\dfrac{180^\circ}{n}}{4}$.
Triangle	3	.433013
Square	4	1.
Pentagon	5	1.72048
Hexagon	6	2.59808
Heptagon	7	3.63391
Octagon	8	4.82843
Nonagon	9	6.18182
Decagon	10	7.69421
Undecagon	11	9.36564
Dodecagon	12	11.19615

Thus, for instance, if the side of a regular hexagon be 9 feet, its area is $81\times2.59808=210.4145$.

Irregular Polygon.—The area of an irregular polygon may be found by dividing it into parts each of which is a triangle, parallelogram, rectangle, or trapezoid. Thus if we draw a system of parallel lines across the polygon, one through each vertex, each part will be a triangle or trapezoid, and its area may be found by formulas (XI) or (XVI).

Circle.—The area a of a circle, whose radius is r and whose circumference is l, is

$$a=\tfrac{1}{2}lr, \qquad \text{(XIX)}$$

or

$$a=\pi r^2. \quad \pi=3.1416=\tfrac{22}{7} \text{ (nearly)}. \qquad \text{(XX)}$$

The area a of the *sector* $OAMB$ (Fig. 1), in which l is the length of the arc AMB and d is number of degrees in the angle AOB, is

$$a=\tfrac{1}{2}lr, \qquad \text{(XXI)}$$

or

$$a=\frac{\pi}{90}dr, \quad \frac{\pi}{90}=.034906585=\tfrac{1}{29} \text{ (nearly)}.$$

The area a of the *segment* $AMBD$ (Fig. 1) is

$$a=\tfrac{1}{2}r(l-r\sin d^\circ), \qquad \text{(XXII)}$$

$$a=\tfrac{2}{3}ch+\frac{h^3}{2c} \text{ (approximately)}, \qquad \text{(XXIII)}$$

or

$$a=\tfrac{2}{3}ch \text{ (approximately)}, \qquad \text{(XXIV)}$$

where r, l, c, h, d have the same meanings as in formulas (II), (III), (IV), and (V).

Parabola.—In Fig. 2 the area a of the segment $VABD$ with base $AB=2y$ and height $VD=x$ is

$$a=\tfrac{4}{3}xy. \qquad \text{(XXV)}$$

Ellipse.—In Fig. 3 the total area a' of the ellipse $ABA'B'$, of which the length of the longest diameter $A'A$ is $2a$ and the length of the shortest diameter BB' is $2b$, is

$$a'=\pi ab, \quad \pi=3.1416 \qquad \text{(XXVI)}$$

General Methods of Approximation.— Any plane area can be divided into parts each of which is a rectangle or differs from a rectangle in that one side is a simple curve as in Fig. 6. It is therefore sufficient to give methods by which an area, such as $ABB'A'$ below, may be measured.

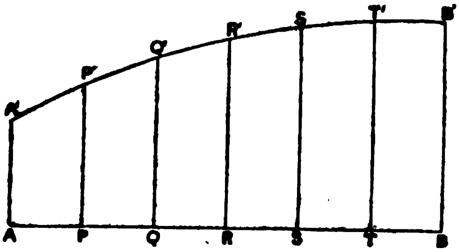

Fig. 6.

1. *The Trapezoidal Method.*—Divide the base line AB into any number of equal parts, AP, PQ, QR, ..., TB and erect the perpendiculars PP', QQ', ..., TT'. Then if each portion $A'P'$, $P'Q'$, ..., $T'B'$ of the curve $A'B'$ is nearly coincident with its chord, the area a is

$$a=\overline{AP}[(\overline{AA'}+\overline{PP'}+\overline{QQ'}+\ldots+\overline{TT'}) -\tfrac{1}{2}(\overline{AA'}+\overline{BB'})]. \qquad \text{(XXVII)}$$

2. *Simpson's Rule.*—Divide the base line into any *even* number of parts (in Fig. 6 it is divided into six parts); erect the perpendiculars as before. Then

$$a=\tfrac{1}{3}\overline{AP}[\overline{AA'}+\overline{BB'}+2(\overline{QQ'}+\overline{SS'}+\ldots) +4(\overline{PP'}+\overline{RR'}+\overline{TT'}+\ldots)] \qquad \text{(XXVIII)}$$

3. *Weddle's Rule.*—Divide the base into exactly *six* equal parts (as in Fig. 6), then

$$a=\tfrac{1}{10}\overline{AB}[5(\overline{PP'}+\overline{RR'}+\overline{TT'})+\overline{RR'}+\overline{AA'} +\overline{QQ'}+\overline{SS'}+\overline{BB'}]. \qquad \text{(XXIX)}$$

SURFACE AND VOLUME OF SOLIDS.

Prism.—This includes any solid two of whose faces, known as the *bases*, are equal polygons situated in parallel planes and all the other faces, the *lateral* faces, are parallelograms. Thus in the following diagram (Fig. 7) the polygons $ABC \ldots$ and $A'B'C' \ldots$ are the bases and the parallelograms $AA'B'B$, $BB'C'C, \ldots$ are the lateral faces. The edges AA', BB', CC', ... are the lateral edges. The polygon $UVW \ldots$ lying in a plane perpendicular to one, and so to all, of the lateral edges is called a *right section.* The right section is equal to the base if and only if the lateral edges are perpendicular to the base

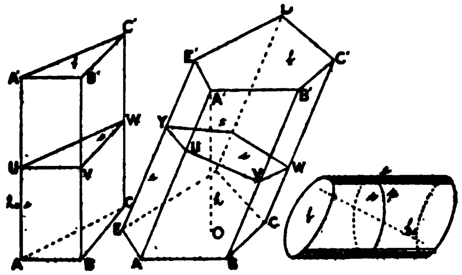

FIG. 7.

For the lateral area a which is the sum of the lateral faces $AA'B'B$, $BB'C'C \ldots$, and the volume v of a prism we have the formulas

$$a = e(\overline{UV} + \overline{VW} + \ldots), \qquad \text{(XXX)}$$

$$v = es, \qquad \text{(XXXI)}$$

$$v = hb, \qquad \text{(XXXII)}$$

in which e = length of a lateral edge (AA' or $BB' \ldots$), s = area of a right section ($UVW \ldots$), h = height, *i.e.*, distance between bases, b = area of a base.

The volume v of a *truncated triangular prism*, that is one with three lateral faces and whose bases are not parallel (therefore the lengths e_1, e_2, e_3 of the lateral edges not equal), is

$$v = \tfrac{1}{3}s(e_1 + e_2 + e_3). \qquad \text{(XXXIII)}$$

Any truncated prism may be divided into truncated triangular prisms and its volume thus found. For a four-sided prism whose opposite lateral faces are parallel this gives

$$v = \tfrac{1}{2}(e_1 + e_3)s, \qquad \text{(XXXIV)}$$

where e_1, e_3 are a pair of opposite edges.

Cylinder.—This includes any solid having two *bases* which are equal plane figures bounded by curved lines (such as circles, ellipses, or irregular figures), and situated in parallel planes, and the rest of the surface of the solid such that it may be thought of as consisting of an infinite number of parallel straight lines. If we call the length of each of these (equal) parallel lines e, the formulas for the prism given above (XXX, XXXI, XXXII) apply also to the cylinder, namely, the lateral area a and the volume v are

$$a = ep, \qquad \text{(XXXV)}$$

$$v = es, \qquad \text{(XXXVI)}$$

$$v = hb, \qquad \text{(XXXVII)}$$

where p is the length of the boundary, and s is the area of the section of the cylinder by a plane perpendicular to one of the lines lying on the lateral surface.

If the right section of a cylinder be a circle, the base, unless a circle, is an ellipse and its area is found by formula (XXVI). If in such a circular cylinder the bases are not parallel and the distance between the centers of the bases is l, then the area a and the volume v are

$$a = lp, \qquad \text{(XXXVIII)}$$

$$= 2\pi rl, \qquad \text{(XXXIX)}$$

$$v = ls, \qquad \text{(XL)}$$

$$= \pi r^2 l, \quad \pi = 3.1416, \qquad \text{(XLI)}$$

where r is the radius of the right section. These formulas are equivalent to (XXXV) and (XXXVI) when the bases are parallel, since then $l = e$.

Pyramid and Cone.—The volume v of any solid, such as those in Fig. 8, whose surface consists of a base, which is a plane figure of *any* kind, triangle, polygon, circle, ellipse, etc., and of triangles or curved areas which may be thought of as composed wholly of straight lines, joining the boundary of the base to some point (the vertex) not in the same plane as the base, is

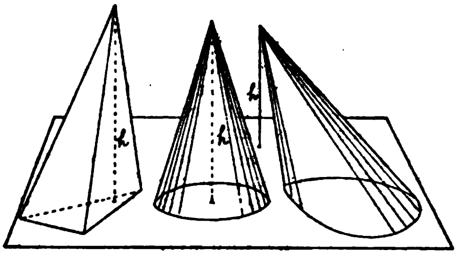

FIG. 8.

$$v = \tfrac{1}{3}bh, \qquad \text{(XLII)}$$

where b is the area of the base and h is the perpendicular distance (height) of the vertex from the plane of the base.

For a right circular cone, that is one in which the base is a circle and the line joining the vertex to the centre of the base is perpendicular to the plane of the base, the area a of the curved (lateral) surface is

$$a = \pi re, \quad \pi = 3.1416, \qquad \text{(XLIII)}$$

where r is the radius of the base and e is the distance from the vertex to any point in the circumference of the base.

Prismatoid.—The volume v of any solid, whose total surface consists of two plane figures (the *bases*), of any character whatever, lying in parallel planes, and a lateral surface made up of triangles, trapezoids, or curved portions which may be thought as made up of straight lines joining the boundaries of the bases, is

$$v = \tfrac{1}{6}h(b_1 + b_2 + 4m), \qquad \text{(XLIV)}$$

where h is perpendicular distance (height) between the bases, b_1 and b_2 are the areas of the bases, and m is the area of a section of the solid by a plane parallel to and half-way between the planes of the bases; or

$$v = \tfrac{1}{4}h(b + 3q), \qquad \text{(XLV)}$$

where b is one of the bases and q is the area of a section parallel to, and two-thirds of the way from, that base to the other.

Solids of Revolution. Sphere.—The area s of the surface and the volume v of a sphere of radius r are

$$s=4\pi r^2,\qquad 4\pi=12.56637\dots \qquad \text{(XLVI)}$$

$$v=\frac{4\pi}{3}r^3,\qquad \frac{4\pi}{3}=4.18879\dots \qquad \text{(XLVII)}$$

The volume v and lateral area a of a *segment* of a sphere (that is the part lying between two parallel planes) are

$$v=\frac{\pi}{6}h[h^2+3(r_1^2+r_2^2)],\quad \frac{\pi}{6}=.5236\dots \qquad \text{(XLVIII)}$$

$$a=2\pi hr, \qquad \text{(XLIX)}$$

where h is the height of the zone (perpendicular distance between the parallel planes of the bases), r_1 and r_2 are the radii of the bases respectively, r is the radius of the sphere.

Spheroid.—For a *prolate* spheroid, that is the solid formed by revolving an ellipse about its longest diameter (in Fig. 3, about AA'), the area s of the surface and the volume v are

$$s=2\pi\left(b^2+\frac{ab}{e}\sin^{-1}e\right), \qquad \text{(L)}$$

or $s=2\pi b(b+fa)$, (approximately.) (LI)

where a, b, and e have the same significance as in (VII) and (VIII) and

$f=1+$ [illegible] $+\frac{3}{40}c^2+\frac{5}{112}c^3+\frac{35}{1152}c^4+\frac{63}{2816}c^5+\dots,$

in which $c=1-\frac{b^2}{a^2}$. Or less accurately

$$s=\frac{\pi}{3}b\left[7a+b\left(6-\frac{b}{a}\right)\right],\quad \frac{\pi}{3}=1.0472; \qquad \text{(LII)}$$

$$v=\frac{4\pi}{3}ab^2,\quad \frac{4\pi}{3}=4.18879\dots \qquad \text{(LIII)}$$

The volume v of a *segment* of a prolate spheroid (part cut off by a plane perpendicular to the axis of revolution) the height of which is h, is

$$v=\frac{\pi}{3}h^2\frac{b^2}{a^2}(3a-h),\quad \frac{\pi}{3}=1.047198\dots. \qquad \text{(LIV)}$$

For an *oblate* spheroid, that is the solid formed by revolving an ellipse about its shortest diameter (in Fig. 3, about BB') the corresponding formulas are

$$s=\pi\left(2a^2+\frac{b^2}{e}\log\frac{1+e}{1-e}\right), \qquad \text{(LV)}$$

or $s=2\pi(a^2+gb^2)$, (LVI)

where

$$g=1+\tfrac{1}{3}d+\tfrac{1}{5}d^2+\tfrac{1}{7}d^3+\tfrac{1}{9}d^4+\tfrac{1}{11}d^5+\dots,$$

in which $d=1-\frac{b^2}{a^2}$;

$$v=\frac{4\pi}{3}ba^2,\quad \frac{4\pi}{3}=4.18879\dots \qquad \text{(LVII)}$$

The volume v of a *segment* of an oblate spheroid is

$$v=\frac{\pi}{3}h^2\frac{a^2}{b^2}(3b-h). \qquad \text{(LVIII)}$$

Paraboloid.—The volume v of the solid formed by revolving VAD in Fig. 2 about VD as an axis is

$$v=\frac{\pi}{2}xy^2,\quad \frac{\pi}{2}=1.5708\dots, \qquad \text{(LIX)}$$

which is just one-half the volume of the circumscribing cylinder.

The General Solid of Revolution.—The volume v of the solid formed by revolving any curve about a line lying in the same plane and not intersecting it, for instance by revolving $A'B'BA$ in Fig. 6 about AB as an axis, is

$$V=\frac{\pi}{3}\cdot\overline{AP}[\overline{AA'}^2+\overline{BB'}^2+2(\overline{QQ'}^2+\overline{SS'}^2+\dots)$$
$$+4(\overline{PP'}^2+\overline{RR'}^2+\dots)]. \qquad \text{(LX)}$$

Or, as it is perhaps usually easier to measure the circumferences of the circles generated by PP', etc., than their diameters, if we denote the circumferences generated by A', P', Q', . . . , B' by a, p, q, . . . , b, respectively, the above formula may be written

$$v=\frac{1}{12\pi}\cdot\overline{AP}[a^2+b^2+2(q^2+s^2+\dots)+4(p^2+r^2+\dots)],$$

$$\frac{1}{12\pi}=.0265258\dots \qquad \text{(LXI)}$$

The Regular Solids.—The area of the surface and the volume of the five regular solids may be found by means of the multipliers given in the following table:

Name.	Area = (edge)² ×	Volume = (edge)³ ×
Tetrahedron. . .	1.7320508	.1178511
Cube.	6.	1.
Octahedron. . .	3.4641016	.4714043
Dodecahedron.	20.6457788	7.6631189
Icosahedron. . .	8.6602540	2.1816950

(LXII)

General Method.—The volume of solids which do not come under any of the types treated above may be measured by an application of the prismatoidal formula (XLIV). Let a_1, a_2, a_3, . . . , a_{2n}, a_{2n+1} be the areas of a set of plane sections parallel to a suitably chosen base and dividing the solid into an even number ($2n$) of portions; a_1, a_{2n+1} being the end sections (that is the solid lies wholly between a_1 and a_{2n+1}). The distance between consecutive cutting planes is to be the same throughout and to be taken so small that between the odd-numbered sections the solid is approximately a prismatoid. The area of a section may be found by surrounding it by a rectangle and measuring (by XXVII, XXVIII, or XXIX) the portion of the rectangle outside of the section. If the distance between the sections be h, then

$$v=\tfrac{1}{3}h[a_1+a_{2n+1}+2(a_3+a_5+a_7\dots+a_{2n-1})$$
$$+4(a_2+a_4+a_6\dots+a_{2n})]. \qquad \text{(LXIII)}$$

Barrel.—If d be the inside diameter of the end of a barrel, c the inside diameter at the middle, and l the length (or height) of the barrel, then the prismatoidal formula (XLIV) gives as the volume v

$$v=\frac{\pi}{6}l\left(\frac{d^2}{2}+c^2\right),\quad \frac{\pi}{6}=.5236. \qquad \text{(LXIV)}$$

The following is said to be a better approximation:

$$v=\frac{\pi}{9}l\left(d^2+\frac{5}{4}c^2\right),\quad \frac{\pi}{9}=.349\dots. \qquad \text{(LXV)}$$

The volume v of the smaller portion of a partly filled barrel, that is of the contents if the barrel is less than half full and of the empty portion if it is more than half full, is

$$v=.000472h(d^2+a^2+4b^2), \qquad \text{(LXVI)}$$

where h is the distance of the surface of the contents from the nearest end, a is the diameter at the surface of the contents, and b is the diameter half-way between the surface and the nearest end.

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Mental Science, an individualistic religious and philosophical belief numbering upward of 500,000 persons in the country who are followers of various beliefs, known as Divine Science, Divine Healing, Spiritual Ethics, Metaphysical Science and other titles. There is no organization of these owing to the variety of belief prevalent among them. Hence mental science stands for no definite set of dogmas; it differs materially from Christian Science (q.v.), in so much as the latter is based on the belief in Christ. A mental scientist bases his belief on the physical powers of the mind, without reference to anything Divine. Mental Science believes in the dominant power of mind over matter and in the cure of all diseases by purely mental effort.

Mentchikof, Alexander Danielovitch, Russian soldier and statesman: b. Moscow 6 Nov. 1672; d. Berezov, Siberia, between November 1729 and February 1730. He was of obscure parentage, but succeeded in entering the service of Prince Lefort, the favorite of Peter the Great, later discovering and thwarting a conspiracy against his patron's life. After serving in the campaign of Azof, he accompanied the czar on his trip through Holland and England, and on the death of Lefort became his chief adviser. He was created field-marshal and prince by Peter, and prince of the German empire by Leopold I., and during the absences of the czar acted as regent. During the campaign of 1706 he defeated the Swedes at Kalish, and in 1709 was largely instrumental in securing the victory over Charles XII. at Pultowa. In 1710, as commander of the Russian forces in the north, he took Riga, occupied Pomerania and Holstein, and conquered Stettin. His arbitrary acts, however, finally resulted in his court-martial by Peter, though the death sentence was commuted to fine. He was one of the principal factors in the accession of Catharine I. to the throne (1725–7), and till her death was all powerful, and even after Peter II. succeeded to the throne he had absolute control of the government. He was about to marry his daughter to the young czar when he was suddenly overthrown by Dolgoruki (September 1727) and banished to Siberia.

Menthene, mĕn'thĕn, a colorless hydrocarbon oil having the formula $C_{10}H_{18}$, and obtained by dehydrating menthol ($C_{10}H_{20}O$) by the action of strong sulphuric acid, or by distilling it with zinc chloride or phosphorus pentoxid. It has a specific gravity of about 0.81 and boils at 333° F. It does not mix with water, but is moderately soluble in alcohol and in ether, and dissolves in benzene, turpentine, or petroleum.

Men'thol (peppermint-camphor), a brilliant white crystalline substance separated from the essential oil of mint (*Mentha*). It is obtained from official (also from Chinese and Japanese) oil of peppermint. Like thymol, menthol has considerable antiseptic power. It is chiefly used combined with chloroform and oils as a liniment for the relief of pain, or locally in the form of pencils as a remedy for neuralgic headache. Sometimes menthol is used internally in solution for relief from nausea, flatulence, and colic, but it is more apt to excite inflammation of the stomach and intestines than the milder preparations of peppermint.

Mentone, mĕn-tō'nĕ (Fr. MENTON, mŏṅ-tôṅ), France, a seaport town and health resort on the Mediterranean, in the department of Alpes-Maritimes, near the Italian frontier, and 19 miles by rail northeast of Nice. It is charmingly situated on a promontory about the middle of a bay five miles in circuit, encircled by abruptly rising hills. The ancient walls of the feudal town are still standing, and there the streets are dark and crooked. The new part of the town, with numerous fine villas, stretches along the base of the hill on which the old part is situated, parallel to the sea. The climate of Mentone is mild and equable; it is rare that the thermometer descends as low as the freezing point, or rises higher than 30° C. (86° F.), hence making Mentone a favorite resort for persons in delicate health. There is a considerable trade in fruit, in flowers, and leaves used in the manufacture of perfumes, and in olive-oil. The town of Mentone belonged to the principality of Monaco from 1346 to 1860, but in the latter year was ceded to France. In the vicinity, but on Italian territory, are the grottoes of Baoussé Rousse, popularly known as the Caves of Mentone, famous for the valuable evidences of prehistoric man that they have yielded. Pop. about 16,000.

Men'tor, according to Greek legend, the faithful friend of Ulysses, who entrusted to him the care of his domestic affairs during his absence in the war against Troy. The education of the young Telemachus fell to his charge, and when the latter set out on his voyage in search of his father Minerva accompanied him under the form of Mentor (Odyssey, ii. 390; iii. 12, etc.), acting the part of a prudent and experienced counsellor to the young hero. This character of a sage adviser is more fully developed in the Télémaque of Fénelon, in which Mentor plays a conspicuous part.

Menzaleh, mĕn-zä'lĕ, or **Menzala,** Egypt, a large lake or lagoon extending from Damietta to the Suez Canal, and running parallel with the Mediterranean, from which it is divided by a narrow slip of land, from 2 to 12 miles in breadth. Length of the lake from northwest to southeast, about 38 miles; breadth, about 20 miles. It receives the Pelusiac and Tanitic branches of the Nile, and communicates with the sea by three openings called Dibeh, Gemileh, and Om Farejeh. The lake is of comparatively recent origin, and covers what was a fruitful district of the delta, having formed through neglect of the dams. There is a small town of the same name on the south side of the lake. The Suez Canal runs along its eastern edge from north to south.

Menzel, mĕn'zĕl, **Adolf Friedrich Erdmann von,** German artist: b. Breslau 8 Dec. 1815; d. Berlin 9 Feb. 1905. In 1830 his parents settled in Berlin, where his father had a lithographic studio, and where the son studied a little in the Academy and more by himself. At 18 he published a cycle of lithographs called 'An Artist's Wanderings,' which immediately attracted attention; four years later he had begun to draw historical scenes from the past of Brandenburg and had commenced painting in oils with 'Checker-Players' (1836) and 'Judgment' (1837). About the same time his work as an illustrator opened up with the 400 pictures for Kugler's ‹Frederick the Great› (1840), in which Menzel showed himself original, dramatic, and historically correct. This vein he followed out in his 200 illustrations for the ‹Works› of Frederick the Great, and in 600 more accompanying a work on the army of Frederick the Great (1856); as well in his oil paintings, a dozen or more, of various scenes in Frederick's life. A trip to Paris in 1867, so the French critics claim, worked a change in Menzel's methods, so that he applied himself more to problems of light and shade. After 1890 he used color less and less and in his pencil drawing broke away from mere line to the use of a cloudy treatment. He was one of the greatest of German artists of his day; and in 1899 he received the Order of the Black Eagle, conferring hereditary nobility. Apart from his historical pictures, mention should be made of the ‹Modern Cyclops› (1875), the interior of a Silesian rolling mill, with excellent lights, and of social satires like ‹Carnival Morning› (1885). Consult Jordan, ‹Das Werk Adolf Menzels› (1895); and lives by Sondermann (1895), and Knackfuss (1897).

Menzel, Wolfgang, German author: b. Waldenburg, Silesia, 21 June 1798; d. Stuttgart 23 April 1873. He studied at Jena and Bonn, became a follower of F. L. Jahn and the Turnerei, and was for four years schoolmaster at Aarau in Switzerland. In 1825 he returned to Germany, having already made himself known to the literary world by his ‹Elastic Verses› (1823). He edited and contributed to magazines, and wrote a very great number of works, poems, romances, histories, criticisms, political polemics, and Christian theology. From 1826 to 1848, and again later, he was editor of the ‹Litteraturblatt› in Stuttgart. His chief writings include histories of Germany (1825), German literature (1827), German poetry (1858), Europe (1853–57), and the world (‹Universal History› 1862–72). He also produced a work of mythological research (1842), a book on the pre-Christian doctrine of immortality (1869), and autobiographical memoirs (1876). He was often involved in controversy, assailing with equal zeal theological rationalists and political radicals. His attacks upon Goethe and other authors were fully equaled for virulence by the criticisms upon Menzel himself, made by Heine and some of the younger German writers.

Mephistopheles, mĕf-ĭs-tŏf'ĕ-lēz, a name for the devil, which has been made popular by Goethe's ‹Faust.› Goethe derived it from an old popular legend, in which it is spelled *Mephistophiles* or *Mephistophilis*. The etymologies of the word are as various as the spelling. Some suppose it to be an irregularly formed Greek compound from the negative *mē; phōs*, light; and *philos*, loving, thus signifying «not loving the light.» Others surmise that it may be derived from the Latin *mephitis* and the Greek *philos*, in which case it will signify literally «loving the mephitic vapors of hell.» The Mephistopheles of Goethe has little in common with the devil of the popular imagination. He appears, especially in the original form of the drama of Faust, as a real man of flesh and blood, who only preserves those traits of the popular devil of the Middle Ages which are compatible with a true human individuality — as the companion of Faust, as a selfish and malevolent votary of pleasure, always looking to the real, and bringing back Faust by cold and heartless irony, from barren speculation to the enjoyment of the present life.

Meran, mā-rän', Austria, a celebrated health resort in Tyrol, charmingly situated on the river Passer, near its entrance into the Adige, at the foot of a hill called the Küchelberg. It consists of an old and a new town, the latter with handsome villas and hotels, and numerous fine residences and old castles in the neighborhood. Lying in a sheltered situation on the southern slope of the Alps, it possesses a mild and equable climate, and is much frequented in winter by invalids with pulmonary affections. Pop. about 10,000, with suburbs 19,000.

Mercadante, Saverio, sä-vä'rē-ō mĕr-kä-dän'tä, Italian composer: b. Albamura 26 June 1797; d. Naples 17 Dec. 1870. He studied music at the college of S. Sebastiano in Naples under Zingarelli. From flute and violin he turned to vocal music; won great success with a cantata ‹L'Unione delle Belle Arti› in 1818, and with an opera ‹L'Apoteosi d'Ercole› in 1819; was made chapel-master of the Novara Cathedral (1833) and director of the Naples Conservatory (1840); and in 1862 became totally blind. He wrote many masses and other ecclesiastical music, such as ‹The Seven Last Words›; but is best known for his operas, of which the following, out of a total of 50, should be mentioned: ‹Elisa e Claudio,› ‹Il Bravo,› ‹Il Giuramento,› ‹I Briganti,› and ‹Le due illustri Rivali.›

Mer'cantile Agency, an American business and detective enterprise; an incorporated company which agrees to furnish subscribers who pay a yearly fee, with information as to the responsibility, financial standing and property interests of private individuals, or firms or corporations. The mercantile agency sometimes makes a business of collecting debts and bills of account. The business originated in the United States in 1837, following the financial panic of that year. Lewis Tappan was the founder of the first enterprise of this character in New York city. Consult: Errant, ‹The Law Relating to Mercantile Agencies› (1889); Reinhard, ‹A Treatise on the Law of Agency› (1902).

Mercap'tans (Latin, «taking up mercury»), or **Thio-Alcohols,** in chemistry, a large class of substances having the same constitution as the alcohols, but differing from them by having the oxygen atom in the hydroxyl replaced by sulphur. They are oily liquids or crystalline solids having an offensive, garlic-like odor, and are all insoluble in water. They possess acid tendencies that are more marked than those of the alcohols, and combine with metallic oxids to form salts which are known as «mercaptides.» They combine with especial facility with mercuric oxid, and take their name from this circumstance. Ethyl mercaptan is the best known member of the series, and it is this substance that is understood when «mercaptan» is spoken of, without further qualification. Ethyl mercaptan, $C_2H_5.SH$, is prepared by acting upon ethyl chloride, C_2H_5Cl, with potassium hydrosulphid, HKS; the potassium atom and the ethyl radical changing places as indicated by the equation $C_2H_5Cl + HKS = C_2H_5SH + KCl$. Ethyl mercaptan is a colorless, mobile, liquid, boiling at 99° F. It is very inflammable, burning with a blue flame, and it mixes readily with alcohol and ether, though only to a very slight extent with water. Like the other mercaptans, it forms salts with the oxids of the metals, the hydrogen atom that is associated with the sulphur being the one that is replaced by the metal. The mercury salt, $Hg(S.C_2H_5)_2$, may be prepared very readily by agitating the mercaptan (or its alcoholic solution) with red oxid of mercury, HgO. Its formation is attended by the liberation of considerable quantities of heat, and the mercaptide itself is obtained in the form of soapy white scales. All of the metallic mercaptides are decomposed by hydrochloric acid. The mercaptans of fatty radicals all give a fine green color when treated with a solution of isatin in strong sulphuric acid and this reaction (as well as their insufferable smell) is used as a test for their presence.

Mercator, mėr-kā'tôr, **Gerardus** (Latinized form of GERHARD KREMER), Flemish mathematician and geographer: b. Rupelmonde, Flanders, 5 March 1512; d. Duisburg 2 Dec. 1594. He studied at Louvain, and became a lecturer on geography and astronomy, making his instruments with his own hands. Recommended to Charles V., Mercator entered into the emperor's service, and executed for him a celestial globe of crystal, and a terrestrial globe of wood. In 1559 he retired to Duisburg, and received the title of cosmographer to the Duke of Juliers. His last years were devoted to theological studies. He is known as the inventor of a method of projection called by his name, in which meridians and parallels of latitude cut each other at right angles, and are both represented by straight lines, which has the effect of enlarging the degrees of latitude as they recede from the equator. His first maps on this projection were published in 1569; the principles were first explained by Edward Wright, in 1599, in his 'Corrections of Errors in Navigation,' whence the discovery has sometimes been attributed to him. His 'Tabulæ Geographicæ' (1578) is the best edition of the maps of Ptolemy. See MAP.

Mercator's Chart or Projection. See CHART.

Mercedas, mĕr-sā'dās, Argentina, town, in the province of Buenos Ayres, on the Pacific railroad; about 40 miles west of the city of Buenos Ayres. In 1779 it was founded as a military station. An Irish colony settled here about 1800. Mercedas is in a region where the chief occupation is raising sheep and cattle. It has several manufacturing establishments, among which are flour-mills, soap factories, and cattle-yards. The shipments are principally wool, hides, and flour. The town has a public library and a college. Pop. about 11,000.

Mer'cenaries, or **Stipendiaries,** foreigners or others who received pay for their services as soldiers, especially as distinguished from government soldiers or those owing military service to the crown or nation. Hired professional soldiers appear very early in the history of military organization. Foreign mercenaries appear in the armies of Alexander the Great and the Romans. They were common in all armies, but generally engaged for a single campaign only. In England, Harold had a body of Danes in his army when he defeated the Norwegian king — the hus-carls, a body originally established by Canute. William III. had for some time a body of Dutch troops in his pay after he became king of England; and throughout the 18th century Hessian and Hanoverian regiments were constantly in the pay of the British government for temporary purposes. Hessians fought for Great Britain in the Revolutionary War; and the landgrave of Hesse, who sold his troops at so much a head, received upward of $2,500,000 for Hessian soldiers lost in that struggle. Americans have fought as hired soldiers in China, South Africa, and in nearly all the countries of Central and South America. They are generally known as "soldiers of fortune." Most of the officers in the regular Chinese army are either Englishmen or Americans. But most famous of all mercenaries were the Swiss soldiers, who were hired, sometimes by the cantons themselves, over all Europe, and formed many famous body guards. They were long employed by the French monarchs; and the Vatican at Rome still has its Swiss guards.

Mercer, mėr'sėr, **Henry Chapman,** American anthropologist: b. Doylestown, Pa., 24 June 1856. He was graduated from Harvard in 1879, where he was curator in 1894–7. In 1893–7 he was anthropological editor of the 'American Naturalist.' He has made extensive investigations and studies in anthropology in America, discovering several new extinct species, and has written: 'Lenape Stone' (1885); 'Researches Upon the Antiquity of Man in the Delaware Valley and the Eastern United States' (1897); 'Tools of the Nation-Maker' (1897); etc.

Mercer, Hugh, American general: b. Aberdeen, Scotland, about 1720; d. near Princeton, N. J., 12 Jan. 1777. Educated as a physician, he served as surgeon's assistant in the army of the Young Pretender at the battle of Culloden. Emigrating in 1747 to America, he settled in Virginia, and resided there, in the practice of his profession, until 1755, when he volunteered in the expedition led by Braddock to Fort Duquesne. At the outbreak of the Revolution he promptly joined the Continental army, and obtained the rank of brigadier-general. He subsequently accompanied Washington on his retreat through New Jersey, and rendered valuable assistance at the battle of Trenton. In the succeeding action at Princeton he was mortally wounded and died a week later. Mercer County, N. J., was named in his honor.

Mercer University, Macon, Ga., is an institution having its genesis at a meeting of the Baptist Associations of Georgia, at Powelton, 27 June 1822, held to discuss, among other matters, the question of ministerial education. In 1827, at a similar meeting, held in Washington, Ga., the project was further discussed, and in 1829, Josiah Penfield, of Savannah, bequeathed $2,500 as a fund for education, on condition that the Baptists should raise an equal amount. This was promptly done, and two years later it was resolved to establish "a Classical and Theological School . . . open only for those preparing for the ministry." It was soon seen, however, that the school could not be so restricted, and in 1832 this bar was removed. Mercer Institute was established on a site of 450 acres, at Penfield, in January 1833, with 39 students,— "Penfield" in memory of Josiah Penfield, and "Mercer," after Dr. Jesse Mercer, early conceiver and patron of the school. In 1837, a charter was obtained giving the institution collegiate rank, and changing its name to «Mercer University.» Thereafter it grew steadily. The successive presidents were B. M. Sanders; Otis Smith; John L. Dagg; N. M. Crawford; H. H. Tucker; A. J. Battle; G. A. Nunnally; J. B. Gambrell; and P. D. Pollock, still in office. The Civil War threw its affairs into temporary confusion, and in 1871 the college was removed to Macon. Since then its resources and influence have been greatly increased, gifts have been frequent and generous, and its educational status has become recognized as sound and sure. Its alumni roll includes very many distinguished names. Mercer University at present comprises three colleges — Arts, Law, and Pharmacy. Its campus covers 20 acres; the buildings number 13, of which six are of brick and stone. The assets of the University amount to nearly half a million dollars. The present enrolment is 275, the number of instructors 25.

GEORGE HERBERT CLARKE,
Mercer University.

Mercerized Cotton, a process invented by John Mercer, of Lancashire, England, for treating cotton fibre or fabrics. The system was first patented in 1851. The process consists of steeping the cloth in a solution of caustic alkali. The tissue shrinks one fourth and takes more brilliant colors in dyeing than unmercerized cotton goods.

Mercersburg, mėr'sėrz-bėrg, Pa., borough, in Franklin County; at the terminus of a branch of the Cumberland Valley railroad; about 70 miles southwest of Harrisburg. It was settled in 1730 and was originally called Black Town. It was incorporated in 1831. The borough was enlarged in 1901. It is in a farming section of the county, but has some coal and iron interests. It was formerly noted for its educational institutions, which were under the auspices of the German Reformed Church in America. It is the seat of the Mercersburg Academy, which in 1902 had about 200 students and property valued at $130,000. Mercersburg was the home of James Buchanan (q.v.). Pop. (1910) 1,410.

Mercersburg Theology, a school of religious philosophy founded by F. A. Rauch of the German Reformed Church in 1836, his work being taken up by John W. Nevin (q.v.) and Philip Schaff (q.v.). The name comes from the Mercersburg (Pa.) Theological Seminary of the German Reformed Church, whence the teaching of this system spread. The Mercersburg theology urged that the Church was not a voluntary society of believers but a historic and spiritual growth — an attitude showing markedly less hostility to the Roman Catholic Church; that old confessions can not express the modern faith of the church; that the sacraments are more than symbols; that church worship should be orderly — hence the ‹Liturgy› (1858) and ‹Order of Worship› (1866); and that religious education is of prime importance. The Mercersburg movement infused new life into the German Reformed Church. Consult Appel, ‹Life of John Williamson Nevin› (1889).

Merchant Marine. See AMERICAN MERCHANT MARINE.

Merchant Marks. See MONOGRAM; TRADEMARK.

Merchant of Venice, The, a comedy by Shakespeare (1594). It appears on the ‹Stationers' Register› in 1598 and was issued in quarto in 1600, 1637, and 1652. The story of the bonds and that of the caskets are both found in the ‹Gesta Romanorum,› but the poet used especially Giovanni Fiorentino's ‹Il Pecorone› (Milan, 1558). Inadequate versions of the play by Dryden, Otway and others were seen on the stage till 1741 when Macklin produced the original play.

Mercia, mėr'shĭ-ạ, England, the largest kingdom of the Saxon heptarchy, now comprised in the midland counties on both sides of the Trent from the North Sea to Wales. Mercia was founded by Crida in 585. Like the other Anglo-Saxon kingdoms it had a stormy history, being almost continually at war with some of its neighbors. In 827 it was conquered by Egbert, who united the different kingdoms of England into one. As its frontiers extended to those of the other kingdoms, as well as to Wales, it derived its name from that circumstance (Anglo-Saxon *mearc*, march or boundary). See ENGLAND, *History*.

Mercié, Antonin, äṅ-tō-năṅ mĕr-sē-ā̆, French sculptor and painter: b. Toulouse 30 Oct. 1845. He studied under Jouffroy and Falguière; won the first Prix de Rome in 1868; and in 1872 obtained a medal of the first class for his bronze statue of the young David, now in the Luxembourg. His masterpiece was ‹Gloria victis› (1874), followed by a nude throned Juno (1877), a marble statue of ‹Painting› (1890); ‹William Tell,› now in Lausanne; monuments to Thiers, Meissonnier (in front of the Louvre), and Jules Ferry, and ‹Napoleon› on the Vendôme Column. He painted a Venus, now in the Luxembourg. Since 1891 Mercié has been professor in the Paris Academy.

Mercier, Honore', Canadian lawyer, journalist, and politician, some time premier of the province of Quebec: b. Iberville, Quebec, 15 Oct. 1840; d. Montreal, 30 Oct. 1894. He was educated at St. Mary's (Jesuit) College in Montreal and afterwards studied law at St. Hyacinthe, being admitted to the bar in 1865. During his legal studies (1862–64) he was editor of the ‹Courrier de St. Hyacinthe,› the conservative organ of the district. As a journalist he was among those who opposed the project of Canadian Confederation, fearing that the union of the provinces might be fatal to the distinctive position of the French Canadians. This led him to abandon his editorship and to sever his connection with the Conservative party.

During the years immediately following the confederation of 1867 Mercier devoted himself to his profession, but in 1871 he reappeared in politics as the leader of the National Party (also called the Parti noir), whose leading aim was to curtail the power of the Dominion government in favor of provincial rights. On this platform he was elected to the federal parliament for Rouville in 1872, but did not stand for re-election to the parliament of 1873. After some four years devoted to the successful practice of the law at St. Hyacinthe, Mercier was elected (1879) to the Legislative Assembly of Quebec, being appointed solicitor-general of the province in the ministry of M.

Joly. On the defeat of the Joly administration in the same year, Mercier passed into the opposition, of which he presently became the leader.

In 1881 he left St. Hyacinthe to practise law in Montreal. In 1885 the French Canadian population was thrown into a ferment by the trial and execution of Louis Riel, the leader of the North West Rebellion (q.v.). Mercier, heading the agitation thus occasioned, declared Riel to have been a «victim of the fanaticism of Sir John A. Macdonald» (speech at Montreal 22 Nov. 1885). On the strength of the feeling this aroused, the Conservative party was defeated in the provincial elections of 1886 and Mercier found himself at the head of the administration. In this capacity he carried through the legislature the famous Jesuits Estates Act (q.v.), a measure intended to compensate the Jesuits for the property confiscated by the crown at the time of the papal dissolution of the order. In spite of the agitation throughout Canada against the act the Mercier government was upheld in the election of 1890. On a visit to Europe in connection with a provincial loan Mercier was created by the Pope a count and commander of the order of Saint Gregory (1891). In the same year grave charges of peculation were brought against the premier and his colleagues on the ground that a subsidy of $100,000, intended for the Baie des Chaleurs railway, had been diverted to political uses. The investigation ordered by Lieutenant-Governor Angers resulted in the dismissal of the ministry (15 Dec. 1891). This action was ratified by the overwhelming defeat of the Mercier party in the election which ensued. The criminal charges brought against Mercier, as a result of this and a second official investigation, ended in a verdict of not guilty. Mercier remained a member of the assembly but with diminished influence and shattered health. He appears to have planned a movement in favor of Canadian indeoendence, but his death prevented its realization.

STEPHEN LEACOCK,
Lecturer on Political Science McGill University.

Mercur, mĕr'kĕr, **James,** American soldier: b. Towanda, Pa., 25 Nov. 1842; d. West Point, N. Y., 22 April 1896. He was graduated from West Point in 1866 and commissioned in the engineering corps. He was engaged in surveys made under the government and in 1867–72 was assistant professor of natural and experimental philosophy at West Point, after which he was in command of an engineering corps and in 1876–81 assisted in clearing the New York harbor of the obstructions at Hell Gate. He was professor of civil and military engineering at West Point from 1884 until his death. He published a revised edition of Mahan's 'Permanent Fortification' (1887) and the original works, 'Elements of the Art of War' (1888); and 'Military Mines, Blasting, and Demolitions' (1892).

Mercu'ric Chloride. See CORROSIVE SUBLIMATE.

Mercuric Cyanide. See HYDROCYANIC ACID.

Mercury, mĕr'kū-rĭ, the Roman god Mercurius who presided over commerce and gain. See HERMES.

Mercury, the planet of the Solar System which is nearest to the sun. Owing to the position of its orbit, far inside of that of the earth, it is never seen by us at any great distance from the sun, but seems to swing back and forth, first on one side of the central luminary and then to the other. (See SOLAR SYSTEM). Its time of revolution is a little less than three months, and therefore less than one fourth that of the earth. When, starting from a point between the earth and the sun, it has completed a revolution, the earth has moved forward in its orbit, and, in consequence, nearly thirty days more are required to catch up with the earth and again come into conjunction with it. Consequently the time of one synodic or apparent revolution is nearly four months. It follows that its greatest elongations from the sun occur at intervals of nearly sixty days, alternately to the east and to the west. When near its greatest eastern elongations it may be seen in the west toward the close of twilight. When west of the sun it may be seen in the morning after daybreak. To the naked eye it seems to shine as a star of the first magnitude. But as it is never seen in a perfectly dark sky except when very near the horizon, it is not readily observable in high northern latitudes. It is said, in fact, that Copernicus died without ever seeing this planet.

With the aid of a telescope, Mercury may be seen the greater part of the time — in the afternoon when it is east of the sun; in the morning when it is west of it. But it is never seen fully illuminated unless near the farther part of its orbit, beyond the sun, when it may be lost in the effulgence of the sun's rays. When it approaches nearest to us, only a small portion of the hemisphere presented to us is illuminated. Owing to these unfavorable conditions observations on it are extremely difficult, and it cannot be said that anything is certainly known of its physical constitution. The difficulty is increased by its being much the smallest of all the major planets. The result is that nothing is positively known as to the time of the rotation on its axis. About 1800, Schroeter, a celebrated observer of the planets, thought it rotated in a little more than 24 hours. But Herschel found no foundation for this belief, and could see no evidence whatever of a rotation. About 1880 Schiaparelli, the celebrated Italian astronomer, making a very careful study of the planet, under the favoring sky of Milan, was led to the conclusion that, like the moon, Mercury's time of rotation was the same as its time of revolution in its orbit, so that it always presented the same face to the sun. A similar conclusion was reached by Lowell at the Flagstaff Observatory. But the difficulty of seeing any well-defined features on the planet is such that conservative astronomers are still in doubt on the subject, and regard the time of rotation as still unknown, and not likely soon to be determined.

The most remarkable feature presented by the motion of Mercury is that the perihelion of its orbit is found to move forward considerably faster than it ought to by virtue of the attraction of the known bodies of the solar system. The cause of this motion has perplexed astronomers for half a century, and no positive solution has been found. It was at first supposed by Leverrier to be due to the attraction of one or more unknown planets between Mercury and the sun. But, as will presently be shown, this explanation is no longer tenable. Another explanation is that the motion is due to the sun's gravitation diminishing somewhat more rapidly than it would according to the law of the inverse square. If this is so, the perihelion of all the other planets ought to be effected by a similar motion. But it unfortunately happens that, up to the present time, it is not possible to discover with certainty whether there is or is not such an excess of motion in the case of the other planets. The reason of the difficulty is that the eccentricities of the orbits of Venus and of the Earth are so small that such a motion in their perihela cannot be detected until fifty or a hundred years more of observation have been made. In the case of Mars the observations seem to show that there is really such an excess of motion; but the result is not at all conclusive, and cannot be made so until a more perfect comparison than yet exists between the observations of Mars and the theory of gravitation has been made.

Simon Newcomb.

Mercury, or **Markery,** a perennial herb (*Chenopodium bonus-henricus*) of the natural order *Chenopodiaceæ*. Like other members of its genus, it has mealy foliage, and inconspicuous greenish flowers. The tender shoots which appear in early spring are valued as a substitute for spinach, for which purpose the plant is frequently cultivated. In Europe it is better known as Good King Henry. It will grow in any garden soil with practically no attention.

Mercury, or **Quicksilver,** a metallic element which has been known for many centuries, and which is distinguished from the other metallic elements by the fact that it is liquid at ordinary temperatures. Mercury occurs native in the metallic form, but by far the larger part of it is obtained by distilling the native sulphid, cinnabar (HgS), in a current of air which is regulated so as to burn the sulphur of the sulphid, while leaving the mercury in the metallic state. Cinnabar occurs abundantly at Idria, Austria, at Almaden, Spain, and at New Almaden, near San Francisco Bay, and it is from these sources that the mercury of commerce is chiefly obtained. Mercury freezes at 37.9° F. below zero and boils, at the ordinary atmospheric pressure (760 mm.), at 675° F. Its specific gravity at 32° F., when compared with water at 39° F., is 13,596. Its specific heat at ordinary temperatures is about 0.0331, and its average coefficient of expansion between 32° F. and 212° F. is 0.00010085 (Fahrenheit scale). The ratio of the specific heat of the vapor at constant pressure to its specific heat at constant volume has been found, experimentally, to be 1.666, which indicates that the molecules of the vapor are monatomic, and that they behave, so far as their collisions among themselves are concerned, as though they were elastic spheres. (See Gases, Kinetic Theory of.) Mercury may be freed from dust and dirt by filtering it through leather. To remove tin, lead, and other dissolved metals, the mercury may be left for some weeks in contact with concentrated sulphuric acid, and subsequently digested with dilute nitric acid; or it may be several times distilled. Various other modes of purification are also known.

The metal is chiefly used, in the arts, for the extraction of gold from crushed ore or fine gravel, the ore being washed by a gentle stream of water over a copper plate which is amalgamated with mercury. The gold particles, being heavy, sink through the water so as to come into contact with the copper plate, where they are held by the mercury in the form of a gold amalgam. (See Gold and Amalgam.) In physics, mercury is also greatly used for filling thermometers and barometers, and for many other purposes. It is likewise used in medicine, both in the metallic form and in its compounds with other elements. Metallic mercury, when rubbed up in a mortar with confection of roses until its globules are so fine as to be indistinguishable to the eye, is known as «blue-mass,» and is administered in the form of pills, as a cholagogue.

Mercury has the chemical symbol Hg (from «hydrargyrum,» its Latin name), and an atomic weight of 200.3 if $O = 16$, or 198.8 if $H = 1$. It forms two oxids, each of which give rise to a series of stable salts. The metal does not oxidize upon exposure to air at ordinary temperatures, but when heated nearly to its boiling point in air or in oxygen, it slowly oxidizes. with the formation of mercury monoxid (or mercuric oxid), HgO. When prepared in this manner the monoxid is crystalline and red, and for this reason it is familiarly known as the «red oxid.» The same substance may be prepared in an allotropic form by precipitating a solution of mercuric nitrate by the addition of caustic potash, the monoxid then coming down as an amorphous yellow powder. The red oxid turns black when strongly heated, but recovers its color upon cooling. When heated to redness the monoxid decomposes into metallic mercury and free oxygen. It can therefore be used as a source of oxygen; and it was in fact by heating this substance that oxygen was first discovered, by Priestley. By acting upon the red oxid or upon metallic mercury by excess of nitric acid, mercuric nitrate, $Hg(NO_3)_2$, is formed; while if nitric acid is allowed to act upon excess of mercury, mercurous nitrate, $HgNO_3$, is obtained. The corresponding sulphates of the metal are obtained by acting upon metallic mercury with sulphuric acid, mercuric sulphate ($HgSO_4$) or mercurous sulphate (Hg_2SO_4) being obtained, according to the conditions of the experiment. Mercuric sulphid, HgS, which occurs native as the mineral cinnabar, and which is also known as vermilion, is bright red in color, and may be prepared artificially by heating mercury with sulphur, or by passing sulphuretted hydrogen gas through a solution of a mercuric salt. When obtained in the latter way it comes down as a black amorphous powder, which may be brought into the normal red crystalline form by sublimation. Mercury forms two chlorides which are extensively used, especially in medicine. Mercuric chloride (also known as «bichloride of mercury» or «corrosive sublimate»), $HgCl_2$, is prepared by heating a mixture of equal parts of mercuric sulphate, $HgSO_4$, and common salt, $NaCl$; the reaction being $HgSO_4 + 2NaCl = HgCl_2 + Na_2SO_4$. The bichloride is fairly soluble in water, and dissolves readily in a solution of sal ammoniac. It is also quite soluble in alcohol. It crystallizes in the trimetric system, melts at 509° F., and boils at 563° F. It is intensely poisonous, and is one of the most powerful germicides known. It is used in surgery and medicine as an antiseptic and disinfectant, and is occasionally administered internally in very small doses. Mercurous chloride, HgCl (more familiarly known as "calomel," or as the "mild chloride"), is a white powder, insoluble in water, and is greatly used in medicine, both as a cholagogue and otherwise. It may be prepared in various ways, but the usual method is by heating four parts of corrosive sublimate with three parts of metallic mercury; the mercury combining with half of the chlorine of the corrosive sublimate, as indicated by the equation $HgCl_2 + Hg = 2HgCl$. The calomel sublimes, and must then be ground to a fine powder and thoroughly washed, in order to remove any free soluble corrosive sublimate that may not have been decomposed. The so-called "white precipitate," which is obtained when ammonia is added to a solution of corrosive sublimate, has the composition NH_2HgCl. Mercurous oxid, or "black oxid of mercury," Hg_2O, may be obtained as a black powder by digesting calomel with excess of caustic potash. It decomposes into the red oxid and metallic mercury upon exposure to light, or upon being heated to the boiling point of water. Many other compounds of mercury are known, but they are of less importance than the ones here given.

Mercury, Fulminate of. See Fulminates.

Mercury, Medical Uses of. Mercury uncombined is used only for its bulk. Triturated with some other substance it is valuable medicinally and produces specific mercurial effects, local and constitutional. Such compounds are blue mass (blue pill), mercury with chalk (gray powder), mercurial ointment, and mercurial plaster. All mercurial compounds entering the circulation have a peculiar influence over nutrition. This is especially true of the salts of mercury, such as mercurous chloride or calomel, mercuric chloride or corrosive sublimate, and mercurous iodide or the green iodide of mercury. In small doses, especially in syphilis, they are tonic, improving the quality of the blood; in large doses they impair it, and tend to inflame the mucous membrane of the mouth, stomach, and intestines. Calomel and blue pill are largely used for their laxative effects. Mercury in the various forms of powder, ointment, lotion, and plaster is used to remove body-vermin, relieve itching, and as a remedy in certain skin affections. See Poisons.

Mercury Vapor Lamp. See Vapor Lamp, The Hewitt Mercury.

Mercy, Fathers of, Roman Catholic religious congregation founded on the restoration of Louis XVIII., 1814, and approved of by the Pope (1834) under the title 'Society of the Priests of Mercy.' The object of the society is the conversion of sinners by mission preaching, and the practice of the corporal works of mercy. In 1839 the order founded houses in New York and Saint Augustine, Fla., and the fathers have churches for the French population in Brooklyn and Manhattan. The mother house was originally at Paris, but was removed to Rome in 1903 as a result of the Association Law. Consult Delaporte, 'Vie de Jean-Baptiste Rauzan' (1857).

Mercy-seat (Heb. *Kappo'reth,* covering or lid, that is, of the sacred ark in the ancient Jewish tabernacle), an unfortunate and inappropriate term as applied to the cover of the chest or ark containing the two tables of the law, and overspread by the wings of the Cherubim. Between these wings appeared the Shekinah or fiery symbol of the divine presence hovering over the mercy-seat, which consisted most probably of a sheet of the finest gold (Ex. xxv. 17, etc.; xxx. 6; xxxi. 7, etc.). The New Testament writers seem to hold that the term contains by implication the idea of the propitiation (q.v.) (Heb. ix. 5; Rom. iii. 24). The high priest sprinkled on it the blood of the yearly atonement, and some writers think that the term covering as applied to it refers more to the covering of or atonement for sins than to its use in covering the treasures of the ark. In any case the idea of a seat, as if the expression in Psalms xcix. 1, "he sitteth between the cherubims" referred to the earthly tabernacle, is inappropriate. Consult: Pratenias, 'De Judæa Arca' (1727); Werner, 'De Propitiatoria' (1695). See Shekinah.

Mercy, Sisters of, a name given to members of several religious communities founded for the purpose of nursing the sick at their own homes, visiting prisoners, attending lying-in-hospitals, superintending the education of females, and the performance of similar works of charity and mercy. Communities of Sisters of Mercy are now widely distributed over Europe and America. There are also religious under the same name connected with the Anglican Church. The term is applied more specifically to the Order of Our Lady of Mercy, a Roman Catholic order founded for the objects above enumerated in Dublin 1827. The first house in America was established in Pittsburg, Pa., 1843, and from it have sprung 65 convents. Consult 'Leaves from the Annals of the Sisters of Mercy' (1881). See McAuley, Catherine.

Mer de Glace, mār dè glās, France, an Alpine glacier on the northern slope of Mont Blanc, with an area of 16 square miles, and an extreme length of about nine miles. It is formed by the confluence of three branches called the Glacier du Géant, the Glacier du Lechaud, and the Glacier du Talèfre and is noted for its beautiful scenery. It ends as the Glacier des Bois whence flows the Arveyron River, in the valley of Chamouni. From the village of Chamouni the Mer de Glace is easiest visited and Mont Blanc ascended. The glacier has an average flow of two feet a day during summer and autumn.

Meredith, George, English poet and novelist: b. Hampshire 12 Feb. 1828; d. London 18 May 1909. Details of Meredith's life are meagre; little is known of his parentage or of his education except that he was sent to school in Germany and later studied law, which he gave up for literature. For a time he was a pupil of T. L. Peacock (q.v.), whose daughter became his first wife. His residence was for some years at Box Hill in Surrey.

His first work in literature was a volume of poems published in 1851. This was followed, in 1856, by 'The Shaving of Shagpat,' a brilliant, fantastic Oriental tale in which some interpreters have professed to see a political satire. In ‘The Ordeal of Richard Feverel’ (1859), however, he began the course of studies in human temperament which have made his name famous. The novel, unquestionably one of the most powerful in the language, deals with the ordeal of adjustment to the world of a high-spirited youth; it is the conflict between temperament and desire, represented in the hero, and a variety of conventions, most rigidly typified in the “system” of his father, Sir Austin Feverel. The effect of the book is chiefly tragic. ‘Evan Harrington’ (1861), the next novel, is wholly comic in idea; the characters are embodiments of various “humors,” most strikingly represented in the intriguing Countess; the plot, as in all of Meredith's novels, is quite secondary in interest, and springs from the characters. ‘Modern Love,’ a sequence of brilliantly phrased, intricate, 16-lined sonnets, was published in 1861. ‘Emilia in England,’ now called ‘Sandra Belloni,’ appeared in 1864, and its sequel ‘Vittoria’ three years later. The story is that of a young Italian girl of unaffected manners and character, and her life among people of very diverse temperaments and social ideas; the theme of the novel may be regarded as the conflict, among very real people, of the genuine with the sentimental character. Between the two novels appeared, in 1865, ‘Rhoda Fleming,’ perhaps the simplest of all Meredith's novels in style, and a powerful study in character. It deals, on the whole, with a conventionally more humble order of society than that usually found in Meredith's novels, and is rather more direct, but few things in fiction are more impressive than the almost instinctive steadfastness of the heroine or more gloomy than the spiritual confusion that she tries to set in order. In ‘The Adventures of Harry Richmond’ the note is again chiefly comic. Much of Meredith's best work lies in the freshness of the varied scenes of this book, and in the hero's father is perhaps as typical a character of the novelist as can be found, a man whose adventurous fancy and devotion to his son “informs” numberless odd and extravagant acts. Another excellent study of a different sort is ‘Beauchamp's Career’ (1876). It is the analytical, yet lively, story of a young man whose earnestness of character and whose activity caused him, from a conventional point of view, to fail in life. Like other of Meredith's novels it is a great contribution to our understanding of the varieties of human temperament and to our sympathy with them.

In ‘Beauchamp's Career’ perhaps more than in any of his preceding novels Meredith directly explained his aim in drawing character; it was to present a type of motive, and to show how it dominates and gives unity to a series of acts. The motive which causes action is, so to speak, temperamental rather than deliberate; in typical examples like the Countess in ‘Evan Harrington,’ or Beauchamp, for instance, Meredith is interested in the expression of temperament rather than a story. The Countess, on the face of the matter, wished for the social advancement of her family; what she really wanted was scheming for the sake of scheming, and her social ambitions were but the medium of expression. This manner of approaching character, indeed, dominated all the character drawing in Meredith's novels, but it was not expressed as a deliberate theory until the publication, in 1877, of ‘On the Idea of Comedy and the Uses of the Comic Spirit.’ The essence of this essay is that comedy is one of the most wholesome and effectual ways of probing and purifying the ills of the world, that good comedy, as in the plays of Moliére, really enables the reader to recognize what is genuine and discard what is sentimental; unfortunately, instead of good comedy we often are treated, in most literature, to painful moralizings. Meredith's fullest and finest expression of this idea is in his ‘The Egoist’ (1879), unquestionably his masterpiece and one of the chief glories of English fiction. Egoism, that love of self which prevents men from seeing things in their true relations, is one of the fundamental failings of mankind, and Meredith has drawn it, in the inimitable Sir Willoughby Patterne, as a figure of colossal proportions. The novelist's skill and dispassionateness as an artist was never better shown than in the fact that he refuses to give conventional rewards and punishments; for the hero's unfailing egoism permits him in the end to turn to the flattering of his vanity what would ordinarily be regarded as humiliation.

Pursuing his end, an analysis and a synthesis of the springs which govern action, Meredith in his next novel, ‘The Tragic Comedians’ (1880) took a story from contemporary European court life and explained it as a piece of dramatic psychology. The comparative shortness of the novel makes it a good study of the author's method. This novel, too, indicated a tendency on his part to depict the motives and the psychology of people actually in existence rather than, as in ‘The Egoist’ and its predecessors, to draw the embodiment of a type of “humor.” This tendency was certainly evident in his next novel, ‘Diana of the Crossways’ (1885), his greatest popular success, and is shown in the fact that certain of the incidents and characters excited curiosity as to their originals. It is manifest also in his last three books, ‘One of Our Conquerors’ (1890), ‘Lord Ormont and His Aminta’ (1894), and ‘The Amazing Marriage’ (1895), which are perhaps less broadly representative and more particular than his earlier novels. Meredith's writings also include four short stories, ‘The Tale of Chloe,’ ‘The House on the Beach,’ ‘Farina,’ and ‘The Case of General Ople and Lady Camper.’

Meredith, who was one of the last great novelists to hold over, as it were, from the age of Victorian literature, belongs to the so-called psychological school, of which the great popular representative is George Eliot, with whom he is practically contemporary. He differs from her in several important respects: The comedy of character (as the term is understood with Cervantes and Molière) as well as the tragic side of life, is reflected in his pages. His attitude is detached and impersonal, and he never allows his sympathies to intrude upon his study of the type he is treating, a characteristic which accounts for the criticism sometimes made that he lacks temperament, and which is doubtless one of the reasons for his comparative unpopularity. He is more interested in his characters as types of temperament than as individuals, and in this field he has perhaps represented the greatest range and variety of human motive that is to be found in English fiction. Taking strata of society, on the whole, conventionally above those treated by George Eliot, he has made them representative of a great variety of «comic» motives. As a moralist, his attack has been upon those types which are broadly termed sentimental, and in this respect his pictures of such men as Wilfred Pole and Willoughby Patterne are inimitable. The person that he most approves is the simple, considerate, intelligent being, well represented in such minor heroes as Merthyr Powys, Vernon Whitford, Dartrey Fennellan, and Tom Redworth, and pictured to the height of brilliancy in his real heroines. In no other novelist, in no English writer except Shakespeare, can be found so splendid a galaxy of women: Rose Jocelyn, Janet Ilchester, Renée, Cecilia Halkett, Jenny Denham, Clara Middleton, Emilia, Carinthia Jane, and many others, as well as such older ladies as Lady Jocelyn and Lady Charlotte Eglett, are the best tribute to womankind that English literature possesses, and the creation of them is an achievement of the very first rank. His style is frequently criticized as involved and epigrammatic, but no novelist contains passages of greater poetical charm.

Bibliography. The best complete American edition of the poems and novels is by Messrs. Scribner, in 16 volumes. Commentary is scattering and appears chiefly in the form of contemporary reviews. Consult Brownell, 'Victorian Prose Masters' (1901), Hannah Lynch, 'George Meredith' (1891), and, for a varied symposium, LeGallienne, 'George Meredith, Some Characteristics; with a Bibliography by John Lane,' and for his place in the history of the novel, Cross, 'The Development of the English Novel' (1899).

W. T. Brewster,
Professor of English in Columbia University.

Meredith, Louisa Anne Twamly, Australian author and artist: b. Birmingham, England, 20 July 1812; d. Hobart Town, Tasmania, 21 Oct. 1895. She had already published a volume of verse (1835); and 'The Romance of Nature,' illustrated by herself (1836), before she married her cousin Charles Meredith (1839) and removed to Australia, whence they went to Tasmania five years later. She continued her literary activity till the end of her long life, and for many years before her death had been the most prominent Tasmanian author. Among her many books, often illustrated by herself are: 'My Home in Tasmania' (1852); 'Over the Straits' (1860); 'Tasmania: Friends and Foes, Feathered and Furred' (1880). Her prose works were popular in Australia and had also a circulation in England and this country; and her verse, of which she published several collections, was at once pleasing and unpretentious.

Meredith, Owen. The pseudonym of Bulwer-Lytton. See Lytton, Edward Robert Bulwer.

Meredith, Sir William Ralph, Canadian jurist: b. Westminster, Ont., 31 March 1840. He was educated in the University of Toronto and was admitted to the bar in 1861 when he established a law practice in London, Ont. He was a member of the Ontario legislature 1872–94 and became queen's counsel in 1876. In 1894 he was appointed chief justice of the Court of Common Pleas which office he still holds, and he is chancellor of the University of Toronto. He was knighted in 1896.

Mergan'ser, or **Fish-duck,** a duck of the genus *Mergus,* distinguished by the slender cylindrical bill, the upper mandible terminating in a strong hooked «nail,» and the margins presenting the appearance of rows of tooth-like processes. The most widely distributed is the red-breasted (*Mergus serrator*), known as sheldrake in America where it is less numerous than in the Old World. The goosander (*Mergus merganser*) and the nun or smew (*M. albellus*) are familiar European and Asiatic species, while the hooded merganser (*Lophodytes cucullatus*) or sawbill is familiar in North America. The mergansers feed chiefly upon fishes, and swim and dive after their prey with great ease and dexterity. They are essentially northern in their distribution, breed in the far north, and migrate southward on the approach of the colder season. The nest is built of grass and roots, and is lined with down. It is usually placed in a hollow of the bank near water; but some species prefer the greater security of a hollow tree. The flesh is coarse and rank. Eight or ten species are known in various parts of the world. The female alone incubates, but the male watches near the nest. From eight to fourteen eggs are laid, and the young enter the water as soon as they are hatched.

Mergenthaler, mĕr'gan-tä-lĕr, **Ottmar,** American inventor: b. Würtemberg, Germany, 10 May 1854; d. Baltimore 28 October 1899. He was a watchmaker by trade; came to the United States at 18, entered the employ of the United States government at Washington, where he kept clocks and electrical bells throughout government buildings in order; improved apparatus used in the signal service; and in 1876 removed to Baltimore, where he devoted himself to perfecting a type-setting machine. On this he spent several years, his scheme going through four stages, the last of which was the linotype (q.v.). When he had patented this machine he had much difficulty in introducing it. It was perfected by the addition of the Rogers spacer, brought its inventor large profits, and is now in very common use in large printing establishments. Mergenthaler also invented a basket-making machine.

Merger, (1) in law, the sinking or obliteration in conveyancing of lesser estates or property, into greater ones; or the consolidation of two or more estates; (2) a term used in financial or business circles, meaning the consolidation or combination of a particular class of manufactories, railroads or other business interests; generally in the nature of a trust.

Mergui, (mĕr-gē') **Archipelago,** a chain of islands in the Bay of Bengal, off the coast of Tenasserim in Burma, the more northern ones forming a part of the British district of Mergui; area, 10,000 square miles. They are generally covered with trees, and present many picturesque features, rising at some points to the height of 3,000 feet. The inhabitants belong to a race called Selungo. They give little attention to agriculture, obtaining a sustenance mainly by fishing, pearl gathering, and selling edible birds' nests. The Selungs are peaceful and industrious, but few in number. The adjoining seas abound in fish and excellent oysters; pearls of good quality are found.

Merida, Mexico, the capital city of Yucatan. The city was founded in 1542, and is situated on a level plain but little above sea level. There are railway connections with all important points in the interior, and several lines of steamers ply between Progreso, 25 miles distant, and Veracruz, New York, and other prominent commercial ports. The surrounding country is almost entirely devoted to the henequen industry, which has reached enormous proportions in the state. There are manufactories of cotton goods, cigars, panama hats, leather, soap, etc., and considerable trade in sisal hemp. The principal buildings are the government palace, the municipal palace, the Casa del Conquistador Montejo (the first Spanish house built in the city), the old Cathedral, the School of Arts, the Penitentiary, Literary Institute or State College, Normal School for Teachers, Metereological and Astronomical Observatory, Yucatan Museum, Catholic College of San Ildefonso, schools of medicine, surgery, pharmacy, jurisprudence, and notarial instruction; the Literary Institute for Girls, the College for Girls, the Catholic School for Girls, the Tereseano College, the Primary School of Arts and Works, and the Institucion de Beneficiencia Privado, founded by Leandro L. Ayala at an outlay of $1,000,000. There are an Asylum for Maniacs, a Lazareto, a Maternity Hospital, three other hospitals, an Asylum for Mendigos, two theatres, and an arena for bull fights. The Hidalgo Park contains a statue of General Cepeda Peraza; and one symbolizing the peace of the state. Near the great Cathedral are also large statues of Saint Peter and Saint Paul. A Body of Public Security, a Jefe Politico and an Inspector General preserve order and insure safety to all. The streets are paved with asphalt. Merida contains two local financial institutions — the Banco Yucateca, with a capital of $8,000,000, and the Banco Mercantil de Yucatan, with a capital of $6,000,000, and a branch of the National Bank and an agency of the Bank of London and Mexico. Pop. about 42,000.

Merida, Venezuela, town, capital of the state of Los Andes; 5,290 feet above sea-level, at the foot of the Sierra Nevada de Merida, and 70 miles south of Lake Maracaibo. It was founded in 1558 by Juan Rodriguez Saurez. It was almost wholly destroyed by an earthquake in 1812. It is the seat of a bishop, contains one of the two National universities of Venezuela, and has several high schools. Its manufactures are carpets, woolen and cotton goods. Pop. about 11,862.

Mer'iden, Conn., city, in New Haven County; on branches of the New York, New Haven & Hartford railroad; about midway between Hartford and New Haven. Originally the town of Meriden was a part of Wallingford until 1806, when the town of Meriden was incorporated. In 1867 it was granted a city charter. It is situated in an agricultural region, but the city is noted for its large number of manufactories. Some of the principal manufactures are cutlery, silver and plated ware, steel pens, hardware, machinery, screws, vises, glassware, cut glass, malleable iron, bronzes, firearms, brass castings, curtain fixtures, gas and kerosene fixtures, self-playing attachments for pianos and organs, woodenware, tinware, granite, agate-ware, lamp trimmings, etc. The shipments are principally manufactured articles, fruit, vegetables, and tobacco.

The educational institutions are the public and parish schools, a high school and the Curtis Memorial Library. It has the Curtis Home for Orphan Children and Aged Women, the Connecticut School for Boys, and the Meriden Hospital. The government is administered under a charter of 1897. The mayor, who holds office two years, appoints fire and park commissioners, board of taxation and apportionment, police and board of public works. The council elects the health officer, board of compensation, tax collector, plumbing inspector, boiler inspector and fire marshal. The treasurer, sheriff, clerk, and auditor are chosen by popular vote. Pop. (1910) 27,265.

Merid'ian, Miss., city, county-seat of Lauderdale County; on the Mobile & Ohio, the New Orleans & Northwestern, and the Southern R.R.'s; about 90 miles east of Jackson. The city is surrounded by fine farm land on which a large quantity of cotton is raised. The chief industrial establishments are cottonseed-oil mills, cotton mills, lumber mills, railroad shops, cotton-gins and cotton compresses. It is the seat of the East Mississippi Female College (M. E.), founded in 1867 and opened in 1869, the Lincoln School (Congregational) and the Meridian Academy (Methodist Episcopal South) both for colored students. Pop. (1910) 23,285.

Meridian (Miss.), **Expedition to.** In January 1864 Gen. Sherman concentrated two divisions of 10,000 each at Vicksburg under Gens. McPherson and Hurlbut, and 3 February marched eastward with the purpose of destroying Meridian, 150 miles distant, as a railroad centre, and possibly penetrating to Selma, Ala., or, if the opposing forces did not seem too strong at Mobile, to turn southward from Meridian and attempt the capture of that city. Gen. Sooy Smith was to co-operate with a cavalry force from Memphis; Gen. Dodge, in command at Pulaski, Tenn., was to hold Logan at Bellefonte, Ala., for a diversion toward Rome, Ga.; and Gen. Thomas was to demonstrate toward Dalton to prevent troops being sent by Gen. Johnston to Sherman's front. Sherman entered Jackson on the 6th, after heavy skirmishing with cavalry. Decatur was reached on the 12th. Meridian was taken the 14th, the Confederate force, under Gen. Leonidas Polk, being much less than Sherman's, withdrawing toward Demopolis. The arsenal, extensive storehouses, and cantonments were burned. The work of destroying the railroads centring at Meridian began on the 16th, 60 miles being rendered utterly useless to the north and east, and 55 miles toward Mobile. This destruction was of the most systematic and thorough character; 10,000 men worked at it for five days; 61 bridges and culverts, and more than a mile of trestles over swamps were burned; all rails were rendered useless. This object of the expedition was fully gained, as Meridian was not wholly restored as a railroad centre during the war. Thereafter, the transporting of supplies eastward from the State of Mississippi was seriously interrupted for a long time, and was greatly impeded up to the close of the war, while all military operations which required railroad facilities were rendered extremely difficult.

The expedition, however, was not as successful as had been hoped. The Confederates, by the exercise of great energy in the face of many difficulties, so strengthened Mobile as to forbid an advance in that direction. Sherman, not receiving the cavalry support under Gen. Sooy Smith which he had reason to expect from Memphis, was unable to push on to Selma, Ala., one of the great manufacturing cities and storehouses for military supplies of the Confederacy. Smith, in turn, had been unavoidably detained, and Sherman returned to Vicksburg, reaching its vicinity 26 February. His command had marched between 300 and 400 miles, had crossed Mississippi, and inflicted well-nigh irreparable military damage; but had been prevented from carrying out his full programme by Confederate activity in assembling forces in his extreme front.

H. V. BOYNTON.

Meridian, one of the innumerable imaginary lines on the surface of the earth that may be conceived of as passing through both poles and through any other given place, and serving to settle the longitude of places, and thus to mark their exact position. There are also corresponding lines called astronomical or celestial meridians, which are imaginary circles of the celestial sphere passing through the poles of the heavens and the zenith of any place on the earth's surface. These correspond exactly to the geographical meridians, that is, the celestial is exactly above the geographical meridian of any place. Every place on the globe has its meridian, and when the sun arrives at this line it is noon or midday, whence the name (Latin, *meridianus — medius,* middle, and *dies,* day). (See LONGITUDE.) The inconvenience arising from having a fixed meridian in different countries is sufficiently obvious, and geographers, navigators, and astronomers have all found it frequently a source of confusion. After years of fruitless discussion the question of a reference or first meridian for the world came before an international conference held at Washington, 1 to 22 Oct. 1884. There, although the representatives of France and Brazil dissented, it was agreed to recommend the meridian of Greenwich both as the astronomical and as the geographical reference meridian of the world, longitude to be reckoned east and west from this up to 180°. At the same time it was advised that the astronomical day should begin at midnight, mean Greenwich time, the hours for astronomical purposes being reckoned as before from 0 to 24. This arrangement began on 1 Jan. 1885. Previously many foreign map-makers had accepted the meridian of Greenwich as first meridian, Germans and Americans apparently having no jealousy of Great Britain in regard to the matter. The change of time has had some importance for astronomers, but ordinary civil time is still computed much as before. The zone system of reckoning standard time was adopted in the United States in 1883 and in Australia in 1895. In the former country there are four zones: the Eastern, taking time from the meridian of 75° W. (5 hrs. slow on Greenwich time); the Central, with standard meridian 90° W. (6 hrs. slow); the Mountain, 105° W. (7 hrs. slow); and the Pacific, 120° W. (8 hrs. slow). There are three Australian zones: Queensland, New South Wales, Victoria, and Tasmania, with 150° E. (10 hrs. fast) as standard; South Australia, with 135° E. (9 hrs. fast); and Western Australia, with 120° E. (8 hrs. fast). Other standards adopted with reference to Greenwich are: 15° E. (1 hr. fast) for Mid-Europe; 22½° E. (1½ hrs. fast) for Cape Colony; 30° E. (2 hrs. fast) for Natal; 135° E. (9 hrs. fast) for Japan; and 172½° E. (11½ hrs. fast) for New Zealand.

Meridian Circle, in astronomy, an instrument used in observatories to combine the functions of a transit instrument and of the old mural circle. A vertical circle is carried on the axis of the transit instrument and revolves with it, its divisions being read by micrometer microscopes mounted solidly on one of the piers. In this way both co-ordinates of the position of a heavenly body, its right ascension and declination, are determined at the same meridian passage — a great saving of time over the old method with the instruments.

Meridian Conference, an international convention, held in October 1884, at Washington, D. C., for the purpose of adopting a common prime meridian from which to reckon longitudes, and for other kindred purposes. See MERIDIAN.

Mérimée, mā-rē-mā, **Prosper,** French author: b. Paris 28 Sept. 1803; d. Cannes 23 Sept. 1870. He was educated at the Collège Henri IV. and studied law though he never practised it. Under the pseudonym «Joseph Lestrange» he published in 1825 'Theatre de Clara Gozul, Comedienne Espagnole,' an assumed translation from the Spanish of eight prose comedies, but in reality his own work. From that time onward he continued to publish works at frequent intervals and at the same time had an official career of importance. Following the revolution of July 1830, he was made secretary to the ministers of commerce and marine, in 1831 was appointed inspector of ancient monuments, in 1844 became a member of the Academy, and senator of France in 1853. He was a commander of the Legion of Honor in 1860. Beside publishing several important works connected with his duties as inspector of ancient monuments he was the author of 'Colomba' (1840), a very popular novel of the Corsican vendetta; 'Carmen' (1847), a romance upon which the famous opera 'Carmen' by Bizet is founded; 'Lettres à une Inconnue,' his most famous work (1873); 'Lettres à une autre Inconnue' (1875) 'Lettres à Panizzi' (1881); 'Une Correspondance Inédite' (1896). The four works last named are Mérimée's most characteristic writings revealing him as a most loyal devoted friend. They differ widely from his other works, which though often brilliant are hard and unsympathetic, while these are tender and romantic. As a master of style Mérimée had few equals in his day. Consult: Filon, 'Mérimée et ses Amis' (1894); Haussonville, 'Mérimée (1888); Tourneux, 'Prosper Mérimée, ses Portraits, ses Dessins, etc.' (1879).

Mer'ington, Marguerite, American playwright: b. England about 1860. Among her dramas are 'Daphne,' 'Captain Letterblair'; 'Love Finds the Way.'

Meri'no, a woolen or worsted fabric, introduced about 1826, and so named because made from the wool of merino sheep. See WOOL.

Merino Sheep. See SHEEP.

Merit, Order of, a British order instituted by King Edward VII., 26 June 1902, to confer distinction on persons in military, scientific, artistic and professional circles. The order follows the Order of the Bath. Twelve persons were decorated with the new order during 1902–3.

Merit System, The. See CIVIL SERVICE REFORM.

Merivale, mĕr'ĭ-văl, **Charles,** English historian and ecclesiastic: b. Barton Place, Devonshire, 8 March 1808; d. Ely 27 Dec. 1893. He was educated at Cambridge, took orders in the English Church, was rector of Lawford, Essex, 1848–69, and dean of Ely from 1869. He published 'The Fall of the Roman Republic' (1853), which forms the first part of his popular 'History of the Romans under the Empire' (latest ed. 1890); 'General History of Rome' (1875); 'Lectures on Early Church History' (1879); etc. Consult, 'Autobiography and Letters' edited by his daughter (1899).

Merivale, Herman, English statesman and political economist; brother of Charles; b. Dawlish, Devonshire, 8 Nov. 1806; d. London 9 Feb. 1874. He was educated at Oxford, where he was professor of political economy 1837–42. He was under-secretary for the colonies, 1848–59 becoming perpetual under-secretary for India in 1859. He wrote 'Colonization and Colonies' (1841), a much valued work; 'Historical Studies' (1865); 'Memoirs of Sir Philip Francis' (1867).

Merivale, Herman Charles, English author: b. London 1839; d. 15 Jan. 1906. He was educated at Harrow and Oxford, became a barrister of the Inner Temple in 1864 and edited the 'Annual Register' 1870–80. Among his publications are: 'The White Pilgrim and Other Poems' (1875); 'The Cynic' (1882); several plays; 'The Whip Hand' (1884); 'The Dove' (1888). He was a son of J. H. Merivale.

Mer'iwether, Lee, American lawyer, social reformer, and author: b. Columbus, Miss., 25 Dec. 1862. Having obtained a secondary education at Memphis, Tenn., he there published the 'Free Trader' with a brother, Avery, in 1881–3, and in 1885–6 toured Europe afoot from Gibraltar to the Bosporus for study of the condition of Continental workingmen and of the protective tariff. He was appointed by the secretary of the interior to write for the United States Labor Bureau a report on the 'Condition of European Labor,' published in the annual report of the bureau for 1886. In 1886–9 he was employed as a special agent of the department of the interior for which he made investigations of labor in the United States and the Hawaiian Islands, and in 1891 visited the island prisons of the Mediterranean. He was admitted to the bar in 1892, and in 1893 entered practice at St. Louis. In 1889–90 and 1895–6 he was labor commissioner of Missouri. His reports on municipal government and street-railway franchises led to his nomination in 1897 for the mayoralty of St. Louis on the Democratic ticket. He was defeated at that time and also in 1901, when he was candidate of the Public Ownership party. Besides his various reports, he has published 'A Tramp Trip: How to see Europe on Fifty Cents a Day' (1887); 'The Tramp at Home' (1890); 'Afloat and Ashore on the Mediterranean' (1892), and other works.

Merle d'Aubigné, Jean Henri. See D'AUBIGNÉ, JEAN HENRI MERLE.

Merlin, mĕr'lĭn, a semi-legendary British prophet and magician, supposed to have flourished toward the end of the 5th century. The accounts of him are hopelessly mixed with fiction. He was said to be the son of a demon and the daughter of a British prince, and was brought up at Caer-Merlin, a city supposed to be the modern Carmarthen. He received from his father the power of working miracles and was the greatest sage of his time, the counsellor and friend of English kings. Vortigern, according to the legend, on the advice of his magicians, had resolved to build an impregnable tower for security against the Saxons; but the foundation was scarcely laid when the earth opened by night and swallowed it up. The magicians informed the king that to give firmness to the foundation he must wet it with the blood of a child born without a father. After much search the young Merlin was brought to the king. Merlin disputed with the magicians and showed them that under the foundation of the tower was a great lake, and under the lake two great raging dragons, one red, representing the British, one white, representing the Saxons. The earth was dug open, and the dragons began a furious battle; whereupon Merlin wept, and uttered prophecies respecting the future state of England. Merlin is a character in Tennyson's 'Idylls of the King.' A collection of the prophecies attributed to him appeared at Paris in 1498, at London in 1529 and 1533, at Venice, 1554. They can be traced back to about 1360. His prophecies were published at Edinburgh in 1615 and contain also those ascribed to the Cambrian or Welsh Merlin.

Merlin, or **Stone-falcon,** a small and handsome European falcon (*Æsalon regulus*) prevailingly blue, known throughout the temperate parts of the old world, and very similar to the American pigeon-hawk (q.v.). It is fierce and courageous, and is trained in falconry for the pursuit of the birds that form its natural prey.

Mermaid, a mythical being living within and under the sea, having the form of a woman above the waist and that of a fish below it. They are usually described as having great personal charms, and as using these for the purpose of luring imaginative and amorous men to destruction by enticing them into the depths of the sea; and, as a correlative, they are sometimes represented as securing their own destruction by quitting the sea, through marriage with some favored human husband by which they magically obtain temporarily a complete human form and soul, but always end in bringing disaster to one or both of the sacrilegious pair. Mermen are also occasionally heard of, but take an unimportant part in the legendary lore of the sea.

This mediæval notion is doubtless a survival of the primitive fancies, half fearful, half poetic, which created the classic conceptions of tritons, nereids, and the like. Shakespeare wrote (Ant. and Cleop., II., 2, 211):

> Her gentlewomen, like the Nereides,
> So many mermaids, tended her.

All of these ideas probably arose from a mixture of observed human resemblances in certain marine animals with purely mystical fancies which peopled the ocean with similitudes to terrestrial creatures. Primitive men have everywhere derived a large part of their sustenance from the natural products of the waters; and always the vastness and mystery of the sea, full of strange creatures and incomprehensible phenomena, have powerfully affected the imagination of the ignorant and superstitious. To this day the ocean is more familiar and more important in the life of many isolated peoples, who dwell upon its margin and derive their support almost exclusively from it, than is the land; and they invest it and everything it contains with a wondering regard which the inlander can neither share nor understand. To these, even in civilized regions (as on the coast of Ireland or the Hebrides) mermaids remain only one of many present realities, herding sea-cattle and lying in wait for unwary humanity as surely as when sea-horses raced over the Ægean waves with the car of Poseidon or the Sirens tempted the mariners of ancient Greece. In one form or another such stories have been rife in the folk-lore of all maritime peoples since prehistoric times; and, although not so widespread, the belief in mermaids, and their kith and kin, is still a matter of firm faith with hosts of persons in all parts of the world. Folk-lore abounds in evidence of this.

The physical basis for these notions rests upon the resemblance which some marine animals bear to human beings when seen at a distance and in certain attitudes. Such, in northern countries, are various seals, which formerly abounded upon the coasts of western Europe, and still are to be seen in the less frequented spots. They have a way of lifting their round heads and shoulders from the water, with a queer human intelligent look upon their faces, and hugging their young to their bosoms with motherly affection. Impressed with this resemblance, easily turned into a story to beguile a long winter evening or to amuse a child, and growing with imaginative repetitions, the northern peoples were quick to believe the similar and more elaborate stories brought to them by early voyagers from the Mediterranean, and so the tales grew and changed into the rich folk-lore of the coasts of the North Sea.

The southern stories, embellished by classic culture into the sea-myths of Neptune, Proteus and the sea-nymphs of old, and descending into the mermaids and mermen of mediæval folk-lore, yet alive around the Mediterranean and Oriental seas, and among sailors generally, probably have their root in the aspect of the East Indian and African dugongs (q.v.). Near at hand these uncouth monsters would never be mistaken for human beings; but seen at a distance, by fearful and wondering voyagers along the coast, such an error might easily happen, for they frequently stand upright among the weedy shallows of the coasts, perhaps draped with loosened vegetation like long hair, and holding to their breasts a young one who nurses from pectoral mammæ much as a human baby would do. Such reports, brought back to the enquiring poetic minds of Greece, might easily blossom into the tales of sea-mythology which formed so large and real a part of the popular belief as well as of the legendary lore of the classic age of India, Persia and the Mediterranean peoples. The fish-gods of the Phœnicians and other idolaters are closely related.

From this has come down to us the extensive and varied use of mermaids and mermen in heraldry. «In French heraldry,» says Robinson, «the mermaid is called the Siren; in German she has two tails; in the Italian she carries a harp; and in many cases in each country she is crowned. In England it is a very ancient crest, and among others the lords Byron, the earls of Portsmouth . . . and many others display the sea-maiden in their armorial bearing. With her comb and looking-glass she smiles at us from the shields of the Holmes, Ellises, Lapps; and as a supporter holds up the arms of the Viscounts Boyne and Hood, the earls of Howth and Caledon, and is borne by the heads of the families of Sinclair of Rosslyn, and Scott of Harden. Two mermaids crowned are the supporters of the Boston arms.»

Artificial mermaids, claiming to be preserved realities, have formed a part of the stock of curiosities of wonder-shows since time immemorial; and most of those exhibited since the days of Barnum have been the products of Japanese ingenuity. ERNEST INGERSOLL.

Mermaid's Head, a globose sea-urchin, as one of the heart-urchins.

Mermaid's Purse, the egg-case of the skate (or shark), which is often cast up empty on the shore.

Merman. See MERMAID.

Mero, or **Merou,** a West Indian name for a jewfish (q.v.).

Merobandes, Flavius, a Spanish rhetorician and poet of the first half of the fifth century A.D., eminent also as a general, has left us a short hymn in honor of Christ, and fragments of five historical poems. L. Jeep in his edition of Claudian (Leipsic 1876–1879) publishes four of these poems.

Merodach, mĕr'ō-dăk, or **Bel-Merodach.** See BEL.

Meroë, mĕr'ō-ē, Egyptian Sudan, a city and state of ancient Ethiopia, in the north-eastern part of Africa. The city is still represented by ruins and pyramids near Kabati on the Nile north of Khartum, and the state forms the district often spoken of as the Isle of Meroë, extending southeast to Abyssinia, and in the northwest forming a part of Nubia. It was distinguished for its mineral and cereal wealth, and at an early date was the centre of an active and varied commerce including the great caravan trade between Ethiopia, Egypt, Arabia, northern Africa and India. The government was in the hands of a caste of priests, who chose a king who was obliged to live and act according to certain prescribed rules. The priests could sentence the king to death in the name of the gods, and he was forced to submit. The priests were of a lighter complexion than the other inhabitants, and may have come from India. Ergamenes, king of Meroë in the 3d century B.C., during the reign of Ptolemy II. in Egypt, first made himself independent of this oppressive priesthood by murdering the priests in the golden temple. Meroë and Axum (in Abyssinia), which appears to have been a colony of Meroë, remained the centre of the southern commerce till the time of the Arabians. The existing monuments of their architecture, and many other vestiges, exhibit an advanced religious and social cultivation.

Merosto'mata, a sub-class of arthropods, allied to the *Crustacea*, and represented by only a single survivor (the horsefoot crab), but including a large series of fossil forms which flourished in the Palæozoic Age. They were somewhat scorpion-like in form, although sometimes of gigantic size, and ranked between the superior trilobites and inferior arachnids. The Merostomata are characterized by having six pairs of ambulatory limbs about the mouth, the first of which terminate in some, if not in all, cases in chiliceræ. The others serve as organs of locomotion, and their coxal joints for prehension and mastication. The prevailing opinion is that the body is divided into two parts (cephalothorax and abdomen) instead of three (head-shield, thorax and abdomen). The sub-class comprises three orders, *Xiphosura*, the horsefoot crabs (q.v.), several species of which still exist; the *Synxiphosura*, Silurian and Cambrian fossil forms; and *Eurypterida* (see EURYPTERUS). Consult Packard, 'Zoology' (1897), and Zittel-Eastman, 'Text-book of Paleontology,' Vol. I. (1900), which contains an extensive bibliography.

Merovingians, mĕr-ō-vĭn'jĭ-anz, the first dynasty of Frankish kings which ruled in the northern part of Gaul, since called France. They derived their name from Merowig (Merovæus), the grandfather of Clovis. They ruled from 496 till 752, when they were supplanted by the Carlovingians. See FRANCE.

Merriam, mĕr'ĭ-am, **Clinton Hart**, American biologist and author: b. New York city, 5 Dec. 1855. He was graduated from Yale in 1877 and from the College of Physicians and Surgeons in New York in 1879, and practised medicine, 1878–85. He was United States Bering Sea commissioner in 1891 and visited Alaska in the interest of fur seal investigations. He has held various commissions from the government in the field of biology and has made explorations in its interest in the far West. He has written: 'Birds of Connecticut' (1877); 'Mammals of the Adirondacks' (1882–4); 'Results of Biological Survey of San Francisco Mountain Region and Desert of Little Colorado in Arizona' (1890); 'Flora and Fauna of the Death Valley Expedition' (1893); 'Life Zones and Crop Zones of the United States' (1898).

Merriam, Henry Clay, American soldier: b. Houlton, Maine, 13 Nov. 1837. He was graduated from Colby University, and began the study of law; but in 1862 entered the Union army as captain in a Maine regiment. He was at the battle of Antietam in 1862, and organized the colored troops in 1863, being lieutenant-colonel of the Louisiana Native Guard (a negro regiment) at the close of the war; he led the assault on Fort Blakely 9 April 1865, and obtained a medal of honor from Congress for gallant conduct. In 1866 he was appointed major in the regular United States army, and rose to the rank of brigadier-general in 1897 and major-general of volunteers in the Spanish War, 1898. He served in many expeditions against the Indians, and protected American citizens in the valley of the Rio Grande in the revolutionary troubles (1873–6). In 1898 he was commander of the departments of the Columbia and California, and organized, equipped and forwarded the troops to the Philippines; and in 1899 was sent to the Philippines in command of the army of occupation. In January 1900, he was placed in command of the Department of the Colorado, and in 1901 was retired from active service. He is the inventor of the Merriam infantry pack.

Merriam, William Rush, American financier: b. Wadham's Mills, N. Y., July 1849. He was graduated from Racine College, Wisconsin, in 1871 and entered the First National bank of St. Paul where he was cashier in 1873. In 1880 he was president of the Merchants' National bank there and in 1882 became a member of the State legislature of Minnesota and was speaker in 1886. He was elected governor of Minnesota in 1889 and was director of the United States Census in 1898–03.

Merrick, mĕr'ĭk, **Leonard**, English novelist: b. Belsize Park, London, 21 Feb. 1864. He was educated at Brighton College, and among his novels, several of which have been reprinted in this country, are: 'Mr. Bazalgette's Agent'; 'The Man Who Was Good'; 'Cynthia: a Daughter of the Philistines'; 'When Love Flies Out of the Window.' He is also the author of several plays.

Merrifield, mĕr'ĭ-fēld, **Webster**, American educator: b. Williamsville, Vt., 27 July 1852. He was graduated from Yale in 1877 and was an instructor there 1879–83. From 1884 to 1891 he was professor of Greek in the University of North Dakota, professor of political economy 1891–1903, and president of the institution since 1891.

Merrill, mĕr'ĭl, **George Edmands**, American Baptist clergyman and educator: b. Charlestown, Mass., 19 Dec. 1846; d. Hamilton, N. Y., 11 June 1908. He was graduated from Harvard in 1869, and from the Newton Theological Seminary in 1872. Entering the Baptist ministry, he was pastor at Springfield, Mass. (1872–7); at Salem, Mass. (1877–85); at Colorado Springs (1885–7); and at Newton, Mass. (1890–9). In 1899 he was called to the presidency of Colgate University, Hamilton, N. Y., where his administration improved the standard and awakened interest in many new lines of college activity. He wrote 'Story of the Manuscripts' (1881); 'Crusaders and Captives' (1890); 'The Reasonable Christ' (1893); 'The Parchments of Faith' (1895).

Merrill, Lewis, American soldier: b. New Berlin, Pa., 28 Oct. 1834; d. Philadelphia 27 Feb. 1896. He was graduated from West Point in 1855, and at the outbreak of the Civil War was appointed colonel of a volunteer cavalry regiment and served with distinction through the war. He was active in warfare with the Indians and performed the notable service of breaking up the Kuklux Klan in 1868, which was recognized by Congress after some delay by promotion to the rank of lieutenant-colonel of cavalry.

Merrill, Selah, American Congregationalist clergyman and archæologist: b. Canton Centre, Conn., 2 May 1837. He was educated at Yale and at the New Haven Theological Seminary and was ordained to the ministry in 1864 when he entered the Federal army as chaplain. He held pastorates in Leroy, N. Y., and in San Francisco, and was for a time professor of Hebrew at Andover Theological Seminary. In 1882–6, 1891–4 and since 1898 he has been United

States consul at Jerusalem and made valuable archæological researches and discoveries there. Since 1907 consul at Georgetown, Guiana. He wrote 'East of the Jordan' (1881); 'Galilee in the Time of Christ' (1881); 'The Site of Calvary' (1885); etc.

Merrill, Stephen Mason, American Methodist bishop: b. Jefferson County, Ohio, 16 Sept. 1825; d. Keyport, N. J., 12 Nov. 1905. He studied for the ministry and was ordained by the Ohio Conference in 1846, and in 1868–72 was editor of the 'Western Christian Advocate.' In 1872 was appointed bishop. He published: 'Christian Baptism'; 'Union of American Methodism'; 'Sanctification' (1901); 'Miracles' (1902).

Merrill, William Emery, American military engineer: b. Fort Howard, Wis., 11 Oct. 1837; d. near Edgefield, Ill., 14 Dec. 1891. He was graduated from West Point in 1859 and for a year prior to the outbreak of the Civil War was assistant professor in engineering at West Point. He went to the front in 1861, and served with distinction at Yorktown, Chickamauga, Missionary Ridge and other famous battles and in 1864–5 had charge of the railroad which supplied the armies in Georgia and Tennessee and was brevetted colonel for his services. After the war he served as chief engineer on the staff of General Sherman and was engaged in western surveys and the improvement of rivers. He was in charge of the improvement of the Ohio River at the time of his death which occurred on a railroad train. He wrote 'Iron Truss Bridges for Railroads' (1870) and 'Improvement of Non-Tidal Rivers' (1881).

Merrill, Wis., city, county-seat of Lincoln County; on the Wisconsin River, and on the Chicago, Milwaukee & Saint Paul railroad; about 145 miles north of Madison. It was settled in 1875 and incorporated in 1880. It is in a part of the State where the chief industries are connected with lumbering. Merrill has manufacturing establishments for shingles, laths, planed lumber, sawed lumber, sash, doors, and blinds, clapboards, lumber for interior finish, flooring, etc. It has a high school, an opera house, a court-house which cost about $100,000, and the T. B. Scott Public Library. Pop. (1890) 6,809; (1900) 8,537; (1910) 8,689.

Merrimac, mĕr'ĭ-măk, a river of New Hampshire, which has its source at Franklin where the Pemigewasset and Winnipisaukie rivers unite. The Winnipisaukie is the outlet for the lake of the same name; the Pemigewasset has its rise in the northern part of Grafton County, in the White Mountains. The Merrimac flows nearly due south into the State of Massachusetts when it turns, continuing its course east, then northeast to the Atlantic Ocean. The mouth of the river is a tidal estuary which is navigable for steamers of good size. At the entrance is a sand bar which is constantly changing, and which is a hindrance to navigation. The river is navigable for small steamers as far as Haverhill. The extensive water-power of the Merrimac made it one of the most important rivers of the country when the chief motive power for machinery was water. The largest cotton-mills of the country were erected on its banks, and many woolen mills, carpet mills, and other manufactories. Newburyport is at the mouth of the river. Other important places on its banks are Haverhill, Lawrence, and Lowell, in Massachusetts, and Nashua, Manchester, and Concord in New Hampshire. The length from the source of the Pemigewasset to the ocean is 183 miles.

Merrimac, The, a frigate of the United States navy. See MONITOR AND MERRIMAC, THE.

Merriman, mĕr'ĭ-man, **Henry Seton.** See SCOTT, HUGH STOWELL.

Merriman, Mansfield, American civil engineer: b. Southington, Conn., 27 March 1848. He was graduated from Yale in 1871 and in 1872–3 was assistant engineer in the United States corps of engineers. He was instructor in civil engineering at Sheffield Scientific School, Yale, in 1875–8 and from 1878–1907 was professor of civil engineering at Lehigh University. In 1880–5 he was also a member of the United States Coast and Geodetic Survey. He is a member of many scientific societies, and has published: 'Theory of Continuous Bridges' (1876); 'Mechanics and Materials' (1885); 'Treatise on Hydraulics' (1889); 'Precise Surveying and Geodesy' (1899); etc.

Merriman, Titus Mooney, American Baptist clergyman: b. Charleston, P. Q., 23 April 1822. He was graduated from Canada Baptist College, Montreal (now McMaster Hall, Toronto), in 1844, served in the United States Christian Commission during the Civil War, and became a naturalized citizen of the United States in 1882. He was a professor at Laselle Seminary, Auburndale, Mass., 1864–95. He published 'William, Prince of Orange' (1874); 'Pilgrims, Puritans and Roger Williams Vindicated' (1892); etc.

Merritt, mĕr'ĭt, **Wesley,** American soldier: b. New York 16 June 1836; d. Washington, D. C., 3 Dec. 1910. He was graduated from West Point in 1860 and served with honor through the Civil War and for bravery at Gettysburg was brevetted major. His services at the battles of Yellow Tavern and Winchester gained for him the rank of brigadier-general and major-general. He was assigned chiefly to frontier duty from the close of the Civil War until 1882 when he was made superintendent of West Point and in 1887 placed on duty at Fort Leavenworth, Kan. He commanded the Department of the East 1897–8 and in May 1898 was put in command of the United States troops in the Philippines and conducted the campaign to a successful termination. After the close of the Spanish-American War he was ordered to Paris in order to assist the work of the American peace commissioners. He was retired in June 1900.

Merry, Robert, English poet and eccentric: b. London April 1755; d. Baltimore, Md., 14 Dec. 1798. He was educated at Christ's College, Cambridge, and studied law at Lincoln's Inn; inherited a good deal of money from his father, but quickly squandered it; and about 1784 settled in Florence, where he was made a member of the Della Crusca Academy, and wrote much sentimental verse, some of it answered by Hannah Cowley. He returned to England in 1787; printed some of his verse, which was sarcastically praised by Walpole and was the butt of Gifford's 'Baviad'; and in 1791 married an actress. In the meantime he had become infatuated with the principles of the French Revolution and had lived in Paris. In 1796 they came to America, where his wife acted with great success and where Merry was regarded as a very superior poet. 'The Abbey of Saint Augustine,' a play by him, was acted in Philadelphia in 1797.

Merry, William Walter, English Anglican clergyman and classical scholar: b. Worcestershire 6 Sept. 1835. He was educated at Oxford and has been rector of Lincoln College there from 1884. In 1861 he became vicar of All Saints Church, Oxford, was select preacher to the University 1878–9, and again in 1889, and public orator in the University in 1880. He is widely known for his editions of the classics published by the Clarendon Press and including the 'Odyssey' (Books I. to XII., 50th thousand; XIII. to XXIV., 15th thousand); and the plays of Aristophanes. He is the author of 'The Greek Dialects' (1875).

Merry England, a popular name for England. The word merry is used, not in the sense of gaiety, but according to its earlier meaning, that is, agreeable, or pleasant; as in the phrase, "merry month of May."

Merry Mount, a district near the present town of Quincy, Mass., which in the early colonial days of New England was occupied by a party of men belonging to the Church of England. They paid little respect to the rigid and austere habits of the Puritans whom they greatly offended by the laxity of their manners. An attack was made upon this settlement by the forces of the Plymouth colony in 1630. John Lothrop Motley, the historian, produced in 1849 a romance entitled 'Merry Mount.'

Merry Wives of Windsor, a comedy by Shakespeare, first produced about 1600 and first printed in its present form in the 'First Folio' of 1623. An imperfect quarto edition appeared in 1602. According to Rowe it was written at the request of Queen Elizabeth, who wanted to see Falstaff in love, but there is no proof of this. An opera by Nicolai with words adapted from Shakespeare by Mosenthal was brought out in Berlin in 1849. It was entitled 'Die lustigen Weiber von Windsor.'

Mersey, mĕr'zĭ, England, a river rising in the range of hills on the southwest confines of Yorkshire, at the point where Cheshire and Derbyshire join the former. It flows in a general southwest direction to Runcorn, where it expands into an estuary two to three miles broad, near the mouth of which, on the north side, is Liverpool, with Birkenhead opposite, and below which it joins the Irish Sea. Since 1886 a railway tunnel under the Mersey has afforded communication between Liverpool and Birkenhead. The entire length of the river, including the estuary, is from 55 to 60 miles. Principal affluent, the Irwell, to which it is navigable. The Bollin and the Weaver are affluents from Cheshire. With the Mersey and Irwell is now closely connected the great Manchester ship-canal (q.v.) which opens into it.

Merson, Luc Oliver, French painter: b. Paris 21 May 1846. He studied at the Ecole des Beaux Arts and was a pupil of G. Chassevent and of Pils. His first picture exhibited in the Salon was 'Leucothea and Anaxandros' (1867). In 1869 he carried off the Grand Prix de Rome, the supreme ambition of art students, by his painting 'The Soldier of Marathon.' He produced the same year 'Apollo the Destroyer,' now in the Museum of Castres. In 1872 he painted 'The Martyrdom of Saint Edmund of England' (Museum of Troyes). Since then he has devoted his pencil to the portrayal of legendary and mythological scenes and incidents. His chief works in this class are: 'The Vision, a Legend of the 14th Century' (1873); 'A Patriot Sacrifice' (1874); 'Saint Michael' (1875); 'Saint Francis and the Wolf of Agubbio' (1878); 'Saint Isidore' (a triptych) (1879); 'The Judgment of Paris witnessed by Eros' (1884); 'Mankind and Fortune' (1892). He has also frescoed with scenes from the life of Louis IX. the walls of the St. Louis gallery in the Palais de Justice at Paris.

Merthyr-Tydfil, mĕr'thĕr-tĭd'vĭl, or **Tydvil,** Wales, a market and manufacturing town of Glamorganshire, 24 miles by rail northwest of Cardiff, on the Taff, at the northern end of Taff Vale. From an unimportant village in 1780, Merthyr-Tydfil has become a prosperous centre of steel and iron manufactures, owing to its situation near the valuable coal and mineral fields of South Wales, its exports of these various products being considerable. The town has undergone much modern improvement and is noted for its municipal enterprises. Pop. (1901) 69,227.

Mer'ton, Walter de, English bishop: d. 27 Oct. 1277. He was graduated at Oxford University, of which he was appointed chancellor by Henry III. in 1261, and three years later instituted the collegiate, or separate house system of the English University, by establishing the college which is called after his name. Here the secular clergy were to be educated in philosophy, the liberal arts and theology. The system he thus introduced has been the secret of success both to Oxford and Cambridge, and was originated chiefly with the object of raising up secular schools which might check the power of the monasteries and eventually supersede them as centres of education. He was appointed bishop of Rochester in 1274.

Merton College, Oxford, England, was originally founded in 1264 at Malden, Surrey, by Walter de Merton (q.v.), and removed to Oxford in 1274, where its collegiate buildings are among the oldest and most interesting in the city, the chapel especially being noted for its proportions and beauty. The foundation consists of a warden, twenty fellows, eighteen post-masters or scholars, ten exhibitioners, four lecturers, two chaplains, and in 1902, 150 undergraduates. Among its famous alumni are Harvey, Anthony Wood, Sir Thomas Bodley, and Sir Richard Steele.

Meru, mĕr'oo, in Hindu mythology, the sacred mountain on whose summit resides Siva, sustaining and uniting earth, heaven, and hell.

Merv, mĕrv, Russia, an oasis in Central Asia, in the south of Western Turkestan, and about 120 miles north of the frontier of Afghanistan, now traversed by the railroad from the Caspian to Samarkand. It is watered by the Murghab, and produces wheat, cotton, sugar, silk, etc. In the midst of the oasis are the ruins of the ancient town of Merv, founded by Alexander the Great, and subsequently held by Syrians, Arabs, Mongols, and Persians. A new town has grown up on the Murghab, where the railway crosses the river, with a citadel and 10,000 inhabitants. The oasis generally is the principal seat of the Tekke Turcomans, who from this centre used to make predatory incursions into Persia and Afghanistan. In 1815 the oasis was subjugated by the Khan of Khiva, to whom it remained tributary for about 20 years. Subsequently Persia attempted to make good the claims which it had long made to this district, and in 1860 fitted out an expedition for the purpose, which, however, miscarried completely, as did another expedition in 1876. In 1881 General Skobeleff led a Russian expedition against the Tekke Turcomans, captured their stronghold of Geok-Tepe, and received the submission of their principal leader. The district of Merv subsequently came under the power of Russia. Merv is of great strategical importance, and considerable interest was attached to it in connection with the advances made by Russia in the direction of India. Pop. 200,000.

Mer'win, Henry Childs, American lawyer: b. Pittsfield, Mass., 5 Aug. 1853. He was graduated from Harvard in 1814 and was for some years lecturer in the law school of Boston University. Beside editing several legal works he is the author of 'Patentability of Inventions' (1884); 'Road, Track and Stable' (1893); 'Life of Aaron Burr' (1899); 'Life of Thomas Jefferson' (1901).

Merwin, Samuel, American author: b. Evanston, Ill., 6 Oct. 1874. He was educated at Northwestern University (Evanston, Ill.), and published with H. K. Webster (q.v.) 'The Short Line War' (1899), and 'Calumet K.' (1901), independently 'The Road to Frontenac' (1901) and 'The Upper Hand' (1903).

Meryc'odus, or **Cosoryx,** a small antlered antelope fossil in the Miocene formations of the western United States. It was about the size of a dorcas gazelle, but with shorter limbs and neck and belonged to the family *Antilocapridæ,* now represented only by the pronghorn (q.v.); but it bore relatively tall three-tined antlers, which were deciduous and precisely like those of deer. Minute lateral toe-rudiments hung high above all the hoofs, but these were relatively smaller than in deer; in the modern pronghorn no trace of these remains. It was probably a collateral ancestor of the antelopes. *Blastomeryx* is a closely related genus somewhat more primitive. A very complete skeleton, collected by W. D. Matthew, is exhibited in the American Museum of Natural History at New York.

Méryon, Charles, shärl mā-rē-ôṅ, French etcher: b. Paris 23 Nov. 1821; d. Charenton 14 Feb. 1868. He entered the navy, after studying at Brest, but failing health forced his resignation, and he settled in Paris, studying etching there. His chief works were picturesque spots in old Paris, many since destroyed. A series of 23 plates by him appeared 1850–4. His last years were spent in an insane asylum at Charenton. Consult Wedmore, 'Méryon and Méryon's Paris' (1879); Burty, 'L'Œuvre de Charles Méryon,' translated by Huish (1879); Bouvenne, 'Notes et Souvenirs sur Charles Méryon' (1883).

Me'sa, a table-land, or plain; a term common in southern California and Mexico.

Mescal', a fiery liquor produced in Mexico from several species of Agave (q.v.). The most famous liquor however is made from the "hearts" of the species recently described as *Agave tequileana.* The city of Tequila, in the state of Jalisco, is the centre of this particular industry. The Tequila Agave resembles in the appearance of its stiff lance-like leaves the sisal hemp plant, though it sends out its leaves from a great bulb-like cellular mass which forms the heart of the plant. This heart, when denuded from its leaves and detached from the root, is cleft in two, and a dozen of these pieces make a fair load for a mule, for they must be transported from the fields where grown to the city, sometimes a journey of several miles. These hearts are roasted in pits, within the distillery enclosures, dug four or five feet deep and considerably wider. A hot fire is built of mesquite wood, and large stones distributed through the fuel. The "heads" are then heaped over the burning mass until a huge mound is formed, which is covered first with grass and then with earth, and the mass left several days to cook. When the mound is opened the raw product is found to have changed to a dull brown in color, and the juices to have been converted into sugar. While hot and steaming the mass is taken to another pit, stone-paved, on the bottom of which revolves a heavy stone crusher, driven by a sweep and mule power. Here it is ground into pulp, and the semi-liquid mass carried in deep trays on the heads of Indians to the vats where it remains to ferment. Then it goes to the rude stills, and is run off as mescal.

The commercial mescal is a colorless liquor sometimes with a slight amber tint, though much of it is like alcohol. Some of the higher grades are given fancy names which serve as trade-marks. It is far too strong a liquor to be drunk by Americans with impunity, though its fiery quality seems to suit the Mexican taste for hot things. Zotol is another liquor, made in the same way from the bulb-like heart of a species of *Dasylirion,* which is said to be as strong as 95 per cent alcohol. These liquors should not be confounded with aguardiente, which is made from sugarcane. The Mexican name means burning water.

CHARLES RICHARDS DODGE.

Mesca'la. See MEXCALA.

Mesdag, mĕs'däg, **Hendrik Willem,** Dutch marine painter: b. Groningen 23 Feb. 1831. He was a banker, following in his father's footsteps, until his 36th year, when he devoted himself to art, studied under Alma Tadema, who was a relative, and under Roelofs, and lived at The Hague, with a studio at Scheveningen. He takes a foremost rank among modern painters of the sea, and conveys the idea of water-masses and motions very felicitously. The report circulated in American newspapers of his death 4 Aug. 1902 was false. Mesdag's pictures include 'Fishing Boats at Scheveningen,' 'Strand of Scheveningen,' 'Morning on the Scheldt,' 'In Peril,' and many other views of the North Sea. Consult Zilken, 'H. W. Mesdag' (English version by Bell, 1896).

Meshed, mĕsh'ĕd, or **Messhed,** mĕsh'hĕd, Persia, capital of the province of Khorasan, in an extensive valley 500 miles northeast of Ispahan. It is surrounded by walls, and has many ruinous houses, but its principal street is spacious and handsome, having a water-course, the banks of which are shaded by trees, passing through it, while at its extremity are seen the splendid cupola and gilded minarets of the mosque containing the shrine of Iman Riza, the son of Ali, the founder of the Shiites. This tomb has a gorgeous interior, a vast hall, like the central nave of a cathedral, rising loftily into a central dome ornamented with the richest colors and a profusion of gilding. This shrine attracts a vast number of pilgrims. Here also is the mosque of Gohur Shah, considered one of the most beautiful and splendid in Persia. The chief manufactures are velvets, sword-blades, and some silk and cotton goods. A considerable number of the inhabitants are employed in cutting the turquoises obtained in the vicinity. The situation of Meshed on several great caravan routes makes it an important entrepôt for the produce of surrounding countries. Pop. est. 61,500.

Mesmer, Friedrich (or **Franz**) **Anton,** frĕd'rĭн ăn'tōn mĕs'mĕr, German physician: b. Itzmang, near Constance, Baden, 23 May 1733; d. Meersburg, Baden, 5 March 1815. He was educated in medicine by Van Swieten and De Haen of the University of Vienna, made some study of astrology, came to believe in the influence of the stars, and attributed this supposed influence to magnetism. Having at first believed in the cure of diseased bodies by the use of magnets, he came wholly to discard the magnets and declared that an occult force, which he called animal magnetism, pervading the universe, resided in himself and afforded him an influence over others. In 1778 he went to Paris and set the town astir. He had undoubtedly an honest belief in the efficacy of his discoveries and the reality of the phenomena displayed; but he took advantage of popular interest to enshroud his methods with mystery. Finally the government appointed a committee of noted physicians and members of the Academy of Sciences, including Benjamin Franklin, to investigate the matter; and the committee in a report admitting many facts but attributing them to physiological causes and not to any such supposed agency as animal magnetism, so discredited Mesmer that he went to London, and later to Germany. The name mesmerism was formerly applied to the entire class of phenomena now known as Hypnotism (q.v.). Among his writings are 'Mémoires sur la Découverte du Magnétisme Animal' (1779); 'Histoire Abrégée du Magnétisme Animal' (1783); and the 'Mémoire de F. A. Mesmer sur ses Découvertes' (1799). See Animal Magnetism; Hypnotism.

Mes'merism. See Animal Magnetism.

Mesne (mēn) **Process,** in law, an intermediate process which issues pending the suit upon some collateral interlocutory matter. Sometimes it is put in contradistinction to primary and final process, or process of execution, and then it signifies all such processes as intervene between the beginning and end of a suit.

Mes'oderm. See Anatomy, Comparative; Embryology.

Mesohip'pus. See Horse, Evolution of.

Mes'onyx, a primitive carnivorous animal of the group called *Creodonta* (q.v.), which must have resembled in external aspects, when alive, the modern Tasmanian wolf of Australia. Its remains are found fossil in the fresh-water formations of Eocene Age along the eastern base of the Rocky Mountains, and a complete skeleton is mounted in the museum of Princeton University. This specimen (*Mesonyx obtusidens*) indicates an animal as large as a St. Bernard dog, with its hindquarters drooped somewhat, like those of a hyena. Consult Woodward, 'Vertebrate Palæontology' (1898).

Mes'ophyte (Gr. «mid-grower»), m botany and forestry, a term used of plants which grow naturally in soil of moderate moisture. Thus the term is contrasted on the one hand with xerophyte, «dry-grower,» and hydrophyte, «wet-grower,» these latter terms being applied to plants requiring very little or very much moisture. Since soil of moderate moisture varies from moist to dry, whereas both the dryer and wetter soils are comparatively invariable in this respect, it naturally follows that Mesophytic plants show more adaptability to conditions of moisture than either hydrophytes or xerophytes. For the same reason, no doubt, the mesophytic flora, being comparatively stronger, is denser and marked by much wider variations of species, than the scanty and monotonous growths of poorer, because wetter or dryer, soils.

Mesopotamia, mĕs"ō-pō-tā'mĭ-ạ (Gr. *mesos,* middle, and *potamos,* river, signifying the land between the rivers, and called by the Arabians *Al Jezireh,* or the island), Turkey. The Greeks called by this name the extensive region enclosed by the Tigris and Euphrates, and bounded on the north by the Taurus and Masius; but the name is generally applied to the northern part of this region, which is mountainous, and rich in grain, wine, and pasturage; the southern part being flat, dry, and unfruitful. Its Old Testament name is *Aram Naharaim,* or Syria of the Two Waters; and also *Padan Aram,* or Syria of the Plain. It is mentioned in the Old Testament in connection with Isaac and Jacob (Gen. 24 and 27). The Greek title was probably not in use till after Alexander the Great invaded the East. This country has always been inhabited by husbandmen, who live a settled life, and by shepherds, who wander from place to place. The Mesopotamians sprang from the Chaldæans, the primitive inhabitants; from the Cushites, who in the reign of Nimrod built the cities of Edessa and Nisibis; and from the descendants of Shem, of the tribe of Thara. It was originaly a part of Nimrod's dominion. After an interval of more than 700 years (2000 B.C.) Cushan Rishathaim reigned in Mesopotamia, who extended his dominion over the Euphrates. The Israelites, who then possessed Palestine, were compelled to pay him tribute for the space of eight years. In the golden age of the Assyrian power (790 B.C.) Mesopotamia was entirely subjected to that empire, and suffered the fate of its subsequent conquerors. Trajan subjected it to the dominion of Rome 106 A.D., but the Persians did not suffer the Romans to remain long in undisturbed possession of it. It was a constant cause of war between the Persian and Roman empires, and at last Jovian surrendered it to the Persians, 363 A.D. When the Arabs in 651 established a new empire upon the ruins of the kingdom of the Sassanidæ, Mesopotamia was also obliged to submit to the storm. In the year 1040 it fell into the hands of the Seljuks. From that time it had many rulers in rapid succession. Genghis Khan made himself master of it in 1218, but in the year 1360 it fell into the hands of Tur Ali Bey. Forty years afterward Mesopotamia was conquered by Timur, and in 1514 Ismael Sophi incorporated it with the Persian empire. The Persians were, however, in 1554 compelled to cede more than half of it to the Turks; and though they again in 1613 recovered the lost portion, they were unable to withstand the attacks of Amurath IV., who united this in 1637, with many other provinces, to his empire. The people are mostly Arabs, a few Kurds in the north, and some Syrian Christians and Armenians. The people are nearly independent of the Turkish government, although the country is a part of Turkey.

Mesozo'ic Era, in geology, the mid-period of life in geologic time, also called the Secondary Period. Palæozoic precedes and Cænozoic follows this era, these two terms referring respectively to «older» and «newer,» or «earlier» and «later,» forms of prehistoric life. The mid-period is marked by the great development of reptilian life, and is sometimes styled the Age of Reptiles. The subdivisions of the Mesozoic are Triassic, Jurassic, and Cretaceous (qq.v.).

Mesquita, mās-kē'tā, **Salvador de,** Brazilian poet: b. Rio de Janeiro 1646; d. Rome, in the early 18th century. He went to Rome, where he entered holy orders, and was well known for his Latin scholarship. His 'Sacrificium Jephthæ' (1680), a sacred drama, established his poetic fame among contemporaries. His tragedies from profane history, 'Demetrius,' 'Perseus,' and 'Prasias Bithyni,' all appearing at Rome between 1690 and 1700, also had once high rank.

Mesquite (mĕs kēt') **Tree, Algaroba, Honey Pod, Honey Locust, or Cashaw,** a shrub or tree (*Prosopis juliflora*) of the natural order *Leguminosæ.* It is a native of the arid southwestern United States, extends southward to Argentine Republic and Chile, and is found in the Hawaiian Islands, where it was introduced by the missionaries. When well supplied with water it often becomes a widespreading tree of sixty feet in height and three feet in diameter, but ordinarily it is a straggling shrub only a few feet tall. It is usually spiny, bears pinnate leaves, small flowers in cylindrical spikes, and numerous straight or sickle-shaped pods about six inches long. The wood is used for fuel, and when large enough, for building purposes, posts, etc., for which, being very durable, it is well adapted. The leaves and tender shoots are valued stock food, resembling alfalfa hay in composition. The pods, which are very saccharine, are also greedily eaten. They should be dried and ground to obtain the greatest value, since the highly nitrogenous seeds are likely to resist the digestive process. A clear or light yellow gum, which oozes from the trunk and branches in tear-like drops, is used in confectionery and in laundries; and a black gum, probably the same mixed with some coloring matter, is obtained from wounds. Being rich in tannin (sometimes containing 20 per cent) it is used with iron compounds for dyeing. In California, the tree is often planted for hedges. A closely related species (*P. pubescens*) known as tornillo, curly mesquite, and screw bean, is a smaller growing tree or shrub ranging from Texas and Mexico to California. It is characterized by its twisted pods only a couple of inches long. Both species are important sources of honey; the flowers being plentiful for about ten weeks.

Mess, in the army and navy, and particularly the latter, a company of officers, or crew of a ship, who eat, drink, and associate together; in military language, a sort of military ordinary, established and regulated by the rules of the service, for all the officers in a regiment, and supported by their joint subscriptions, supplemented by a small government allowance. Similar institutions are extended to the non-commissioned officers of a regiment.

Messala (mĕ-sā'lạ) **Corvinus, Marcus Valerius,** Roman soldier, orator, and writer: b. about 65 B.C.; d. about 2 B.C. He received a part of his education in Athens, returned to Rome before the second triumvirate, and joined the Senatorial party. He fought with Brutus and Cassius at Philippi, 42 B.C., and afterward attached himself successively to Antony and Octavius, served at the battle of Actium, 31 B.C., and the same year was chosen consul. He subdued Aquitania, of which he was made proconsul, and was honored with a triumph. For a time he was a prefect of Rome, and held the office of augur. Messala was the friend of Horace and other distinguished men of the age, a zealous patron of literature and art, notably of the poet Tibullus, and one of the most eminent of Roman orators.

Messalina, mĕs-ạ-lī'na, **Valeria,** Roman empress. She married Claudius (later emperor) in 38 A.D.; bore him a daughter, Octavia, and a son, Britannicus; proved herself vicious, licentious and vulgar by her many open amours; and in her husband's absence formally married Gaius Silius, whom she attempted to make emperor. Claudius refused or delayed to punish her, and Narcissus, the emperor's favorite, had her put to death (whether with Claudius' knowledge or not is not known) in 48 A.D. Her reputation was whitewashed in Stahr's 'Agrippina, die Mutter Neros' (1880).

Messene, mĕ-sē'nē, the capital of Messenia in Peloponnesus, founded by Epaminondas (369 B.C.) after his victory of Leuctra over the Lacedæmonians, and situated at the foot of the hill of Ithome, the fortress of which formed the acropolis of the new capital. The latter was surrounded by massive stone walls, flanked with towers, of which there are still considerable remains at the modern village of Mavromati. The Greek Archæological Society, in 1895, excavated a colonnade and other parts of the ancient agora. Messene with its acropolis was, next to Corinth, the strongest city of Peloponnesus. It was supplied with water from a fountain called Clepsydra, the spring of which still exists.

Messenia, mĕ-sē'nĭ-ạ, Greece, a nomarchy in the western part of Morea (Peloponnesus), bounded on the north by Elis and Achaia and Arcadia, on the east by Arcadia and Laconia, on the south and west by the Ionian Sea. The greater part of the surface is a fertile plain, but there are mountainous lands in the east and northeast. Kalamata, the capital, is in the southeast on the Gulf of Koron (Messenian Gulf). When Messenia was a state of ancient Greece its chief cities were Methone and Pylos (Navarino). Later Messene (Mavromati) was the capital, and the strong mountain fortress was Ithome. A ridge of Mount Taygetus separated Messenia from Sparta. Messenia is celebrated for the long struggle of the inhabitants with the Lacedæmonians in defense of their liberty. In the first Messenian war (743–723 B.C.) the Lacedæmonians, with the Athenians, invaded Messenia. For twenty years the Messenians defended themselves valiantly under their king Aristodemus, who in consequence of an answer of the Delphic oracle which promised them the victory on condition of the sacrifice of a virgin of the royal family, offered his own daughter as the victim. Her lover, to save her life, declared her to be pregnant by himself; and Aristodemus, to prove her innocence, stabbed her with his own hand, and caused her to be opened and sacrificed. The Messenians, though for some time successful, were finally obliged to submit by the loss of Ithome. About forty years after, they again rose, and thus commenced the second Messenian war (685 B.C.), which ended in their entire subjugation. A part of the Messenians emigrated to Sicily, and there founded Messana (see MESSINA) on the site of the ancient Zancle (668 B.C.). Those who remained were reduced to the state of helots. After 200 years of servitude they again took up arms. This third Messenian war lasted ten years (465–455 B.C.), and resulted in the expulsion of the Messenians from the Peloponnesus. Epaminondas restored them, gathering together the exiles from the various lands in which they were scattered. Within the space of 85 days, they completed and fortified Messene (369 B.C.), and maintained their independence till the country was conquered by the Romans (146 B.C.). The Messenians remained true to their customs, manners, and language through all changes of fortune.

Messhed. See MESHED.

Messiah, The, is a term which is, in John i. 41, and, in John iv. 25, but without the article, applied to Jesus of Nazareth, as the appointed king of the Kingdom of God. The Greek word which is the translation of the Aramaic term meaning Messiah, namely χριστός, in English Christ, is used of Jesus in this same sense throughout the New Testament. The word Messiah itself is a modified transcription of the Greek word Μεσσίας. The exact transcription would be Messias, as the word appears in the Authorized Version in both the passages cited above, and the form Messiah is due to the influence of the form of the original Aramaic and Hebrew word. For the word which appears in Greek as Μεσσίας, was, in Aramaic and Hebrew, מָשִׁיחַ (Māšîᵃḥ). All the forms of the term Messiah, as well as the Greek equivalent, χριστός, and the English Christ, mean Anointed One, and refer to Jesus, when applied to him, as God's Anointed King.

In the Old Testament, מָשִׁיחַ (Māšîᵃḥ) (English Messiah) is used, in a few cases, without the article, and as an adjective, of priests, who were anointed to their office (Lev. iv. 5 and 16, vi. 22). But, in the definite sense of the Anointed One, or the Messiah of Jehovah (the Lord's Anointed), it is used, with a very few possible exceptions, only of kings. Thus, in 1 Sam. ii. 35, it is used of the kings of Israel in general. In 1 Sam. xii. 3 and 5, xxiv. 6 and 10, it is used of Saul; and, in 2 Sam. xiv. 21, xxiii. 1, it is applied to David. In Lam. iv. 20, it denotes Zedekiah, King of Judah; and, in Isa. xlv. 1, it is applied to Cyrus, King of Persia. Two possible exceptions to its use to denote kings may be found in Psa. cv. 15 (quoted in 1 Chron. xvi. 22) and Hab. iii. 13, where it seems to be used to mean the nation of Israel as the priest people of Jehovah, although, even in these cases, it may refer only to the king. In Daniel ix. 25 and 26, it is very difficult to decide the true meaning of this word, because of the great uncertainty in relation to the correct interpretation of these verses. According to the various interpretations which have been given to them this word would mean a high priest, a royal ruler, or that great king of the Kingdom of God known to us as Jesus of Nazareth. It is not certain, however, that both times it is used in these verses it has the same meaning. In Psalm ii. 2, the best and most probable interpretation would make the term denote the great coming king known to us as Jesus the Christ. This is the only passage in the Old Testament in which this term can be taken with any reasonable degree of probability to refer to our Saviour.

In the post-canonical literature, the first clear application of the term Messiah to the great coming king of Israel is found in the Psalter of Solomon, dating from about 63 B.C. In this poetical collection we have a full and clear description of this king and his work under this title. There are, indeed, in the Sibylline Oracles and the Book of Enoch, expressions and terms which must be supposed to refer to the coming and expected king of Israel, but the name Messiah is not used in these writings.

While the pre-Christian use of the term Messiah to denote the divinely appointed and eternal king of the Kingdom of God is thus limited, the Old Testament abounds in statements and teachings relating to this king, and that form of the Kingdom of God in which he is to be ruler and sovereign. In some of the passages relating to this final form of the Kingdom of God it is said that Jehovah himself will be the king, as he was, in reality, in all the history of the kingdom of Israel. See, as examples of passages of this kind, Isa. ii. 2–4, Isa. xxxiii. 22, Ezek. xx. 33, Ezek. xxxiv. 15, Zeph. iii. 15, Zech. xiv. 16. In other passages, in harmony with the idea that, while Jehovah was always the real king of Israel, he was represented in the government by a vicegerent king, his anointed on the throne of David at Jerusalem, it is declared that a great and eternal coming king, who, in some of the passages, is stated to be of the line of David, shall reign as king in the final form of the Kingdom of God. Among the passages of this kind may be cited Psa. cx., Isa. ix. 6 and 7, Jer. xxiii. 5–8, Jer. xxx. 8 and 9, Ezek. xxxiv. 23 and 24, Ezek. xxxvii. 24, Hosea iii. 4, Micah v. 2–5, Zech. ix. 9. Just what will be the relation, in person and in nature, between Jehovah and this Davidic king, is not made clear, or even asserted, in the Old Testament.

Independently, therefore, of the use of the term Messiah, there was a natural and sufficient basis in the Old Testament for the widely-spread belief in regard to the coming of a future Davidic king called the Messiah, which appears to have existed in the time of Jesus. In this belief Jesus himself shared, and this king Messiah, or Christ, he both virtually and formally claimed that he himself was. A virtual claim of this kind is found in Matt. xvi. 13–20, and in the parallel passages, Mark viii. 27–30, and Luke ix. 18–21, and also in the act done by Jesus, of which we have the record in Matt. xxi. 1–11, and the parallel passages, Mark xi. 1–10, and Luke xix. 29–40. A formal claim of Jesus to be the Messiah is found in John iv. 25 and 26.

The rejection of the claims of Jesus by the Jewish nation, and the continuation in that nation of the belief in a coming Messiah, were the occasion of the appearance in Jewish history of several who claimed to be the Messiah after the time of Jesus. Of all these the one who was most generally received as the Messiah by the nation, and who accomplished the most for his people, was Simon bar Cochba (or bar Kozeba), who flourished 130–5 A.D., in the reign of the Emperor Hadrian. For two years and a half, bar Cochba reigned as king, and, at the head of an army of 200,000 men, defied the might of Rome. But, in the end, he and his nation were both crushed beneath the power of Rome.

The Jews of the present day are not all of the same opinion in regard to the Messianic hope. The conservative, or Orthodox, Jews are still looking for the coming of the Messiah, the great king of the line of David. With the liberal, or Reformed, Jews, so far as the term Messiah is used at all, it is made to stand for a personification of a system of ideas and doctrines, and the coming of the Messiah will be the universal acceptance and the world-wide domination of Jewish ideas and the Jewish religion.

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Messina, mĕs-sĕ'nä, Sicily, town and seaport, capital of the province and on the strait of the same name. Messina is walled, flanked by bastions, and defended by a citadel on the south, and several forts both on the east and west. The harbor is one of the best in the Mediterranean, and so much resembles a sickle that the town took its original Greek name from that implement, called *zancle.* Fronting the harbor is a broad quay called the Marina, adorned with statues and fountains and forming a favorite promenade. The streets of the old town are narrow and dirty, but the modern town, built since the earthquake of 1783, is generally composed of houses of two stories, and has spacious streets, well paved with blocks of lava. Among the public edifices are included nearly fifty churches, many of them of great beauty, and adorned with fine sculptures and paintings. The cathedral is a Gothic structure, with a somewhat heavy exterior, but supported within by vast pillars of granite, supposed to have belonged to a temple of Neptune. The viceroy's palace, the archiepiscopal palace, the senate house, grand seminary, college, large and well-endowed hospital, numerous convents, two theatres, lazaretto, and arsenals, are some of the other buildings worthy of notice. The manufactures consist chiefly of silk goods. The trade, both transit and general, is extensive. The principal exports are silks, olive oil, linseed and other seeds, oranges, lemons, and other fruits; corn, wine, and spirits; salted fish, licorice, lemon-juice, shumac, essences, rags, brimstone, etc. The tunny and other fisheries are carried on to a considerable extent. In 1910 the exports were $11,000,000, and the imports about $5,000,000. Messina has a government university, founded in 1549, which had 692 students in 1901. It has departments of law, medicine, science, and classics. It has also a naval seminary, and a number of elementary schools. The town is subject to earthquakes periodically. Messina, under the name of Zancle, is said to have been founded 1004 B.C. The Messenians obtained possession 668 B.C. Pop. 149,778.

Messina, Strait of (Italian, *Faro di Messina;* Latin, *Fretum Siculum*), a channel which separates Sicily from Italy, and connects the Tyrrhenian and the Ionian Sea. It has a length of about 20 miles, and gradually widening toward the south, attains, on the parallel of 38°, a width of 11 miles; but in the north, where it is narrowest, does not exceed two miles. The depth is great, in some parts over 4,000 feet, and a strong current continually running with the tide makes the navigation somewhat difficult, but by no means so formidable as was fabled by the ancients, to whom the rock of Scylla, and the whirlpool of Charybdis, on the opposite side, but at some distance to the south, seemed so dangerous that it was generally believed to be almost impossible to avoid the one without being dashed upon the other.

Mess'mates, Animal. See Commensalism.

Messmer, Sebastian Gebhard, American Roman Catholic prelate: b. Goldach, Switzerland, 29 Aug. 1847. He attended the high school at Rorschach and later the College of Saint George near Saint Gall, afterward entering the University at Innsbruck, Austria. Ordained a priest 23 July 1871, he landed in New York the following October and was appointed professor of theology in Seton Hall College, retaining the position until 1889, in which year he became professor of canon law at the Catholic University, Washington, D. C. On 14 Dec. 1891 he was preconized bishop of Green Bay, Wis., being consecrated 27 March 1892, and assuming charge of his diocese 7 April 1892. He was elevated to the archbishopric of Milwaukee, Wis., 10 Dec. 1903, and on 10 Feb. 1904 took possession of his new see. Archbishop Messmer has been actively interested in the Western Summer School, and recently has devoted much time to the study of socialism, upon which subject he has delivered public lectures. He is the author of 'Praxis Synodalis' (1883), and 'Spinago's Method' (1901), etc. In November 1904, Pope Pius X. sent the pallium to Archbishop Messmer. His diocese (1905) has a Catholic population of about 290,000; 349 priests; 293 churches; 4 seminaries; 149 parochial schools; 7 hospitals; 4 orphanages; 1 infant asylum, and other charitable and educational institutions.

Mestizos, mĕs-tē'zōs, or **Metis** (Spanish, mixed). In countries where Spanish Europeans have settled and intermingled with the natives, the descendants are called *Mestizos.* In Mexico the European Spaniards were called *Chapetones* or *Gachupines*. The pure descendants of Europeans are called *Creoles* (see CREOLES) in similar countries.

Mészáros, Lazar, Hungarian revolutionary soldier and patriot: b. Baja, County of Bács, 20 Feb. 1796; d. Eywood, Herefordshire, England, 16 Nov. 1858. He was first educated for the Church, but subsequently studied law at Pesth. In 1813 he was summoned to join the Hungarian army by the emperor Francis I.; later entered the Austrian army, talking part in the campaigns of 1814–15 against Napoleon, and subsequently in Italy; and several years later was appointed colonel. He was in Italy in 1848, serving as a colonel in an Hussar regiment, when he was chosen by Count Batthyáni, who had formed a new Cabinet, for the portfolio of minister of war. Acting in this capacity he was largely instrumental in bringing the Hungarian army to a high degree of efficiency. In September of that year, having gone to the scene of war in the south, he was defeated before the Rascian ramparts of Szent Tamas. When Austria purposed the subjugation of Hungary, Mészáros took command of the Hungarian forces in the north, but on 4 January his army was routed at Kaschu. In April 1849 after the declaration of independence he again took command of the Hungarian forces, but after the defeats at Szöreg and Temesvár in August he fled to Turkey. He subsequently lived in England, France, the island of Jersey, and in 1853 came to the United States.

Meta, mā'tā, a river of South America, which has its rise on the eastern slope of the Andes Mountains near Bogota in Colombia. It is formed by the junction of two small mountain streams, which unite about 40 miles southeast of Bogota; then flows east-northeast into the Orinoco; a course of about 500 miles.

Metabetchouan, mĕt"a-bĕt-choo-ăn', Canada, a river of Quebec flowing into Lake St. John from the south. It is a broad stream, 90 miles long, and navigable for a considerable distance. The celebrated Falls of Metabetchouan over 230 feet high are near its mouth.

Metab'olism (Greek μεταβολή, a change), the whole series of physico-chemical processes connected with the manufacture of protoplasm and with nutrition and growth. It has been divided into constructive metabolism (anabolism), and destructive metabolism (katabolism). The former comprises the processes by which the substances taken as food are converted into protoplasm, while katabolism is the means by which the protoplasm breaks down into simpler products, such as the excretory or waste matters. Metabolism thus comprises the elementary vital phenomena of plant and animal life. These are the occurrences associated with changes of substance, of form, and of energy. All organisms undergo continual changes of their substance or protoplasm, etc., alterations of their form, and transformations of their energy. Thus as regards food, since all living matter is continually undergoing decomposition, it must take in substances that contain all the chemical elements of which it is constructed, but the food differs with every form of cell. Plants live on inorganic substances and animals on organic, that is, material already prepared; no animal being able to live on simple inorganic compounds. Among animals there is a remarkable adaptation to a single kind of food. For example the larva of the fur-moth lives exclusively upon the hairs of fur, which consist of pure keratin; this substance, which is closely allied to proteid, is therefore capable of furnishing all the elements necessary for the formation of the protoplasm of this caterpillar. Dogs when worked hard have been found to be able to live on pure proteid food. On the other hand, according to Verworn, it is impossible for an animal to live solely on carbohydrates or fats, or even on the two together, since there is no nitrogen in these substances.

Vital motion or metabolism is a complex sharply characterizing living organisms, and the taking in of food and the excretion of waste products give to the organism the material with which to regenerate itself and to grow. Metabolism is increased by heat, the consumption of oxygen being increased in cold-blooded animals, but warm-blooded animals undergo a decrease under heat. Thus man in winter has a much more active metabolism than in summer, since he consumes more food at low temperatures.

It is claimed by Verworn that every species of animal possesses a specific metabolism, and that under certain conditions products of metabolism may stimulate an animal to increased growth, while under other circumstances they may retard growth. Thus the usually deadly uric acid in moderate amounts exerts a favorable influence on the size of larvæ of sea-urchins. Illustrations are afforded by experiments in raising snails and water-fleas (*Daphnia*) in small volumes of water; besides the diminished volume, the water fouled by their excretions may not only dwarf but gradually kill them, or produce changes of form.

Consult Verworn, 'General Physiology' (New York, 1899); Vernon, 'Variation in Animals and Plants' (New York, 1903).

Metacen'tre, in mathematics, the point of intersection of the vertical line passing through the centre of gravity of a floating body *in equilibrio*, and a vertical line through the centre of gravity of the fluid displaced, if the body be turned through a small angle, so that the axis takes a position inclined to the vertical. If the metacentre is above the centre of gravity, the position of the body is stable; if below it, it is unstable.

Metachro'sis, the change of color brought about in the surface of certain animals, either voluntarily or involuntarily, to make them conform to their surroundings. It is exhibited in many of the lower animals as a protective device, especially in cuttlefishes, caterpillars, various amphibians, especially frogs, and certain lizards, notably the chameleons. The dark pigment to which the brown or gray colors of metachroic caterpillars are due is deposited in the cells of the outer skin, while the green coloring matter is found in the underlying fat; and, as Carpenter says, experiments have shown that the presence or absence of both kinds of pigment is determined by the surrounding objects through the quality of the light reflected from them, the suppression of the superficial dark pigment allowing the deeper green to show through the skin, and thus give its hue to the caterpillar. It has been shown that the formation of the dark pigment is hindered by the action of certain yellow rays which are absorbed by dark objects, but reflected from green leaves and shoots.

The process of change in squids, frogs, etc., through nervous and muscular control of pigment sacs, called chromatophores, is somewhat different, and is explained in the article CHAMELEON. The power possessed by these animals of adapting their color to their surroundings must be of great value in ensuring preservation from enemies. Consult Beddard, 'Animal Coloration' (1892).

Metacin'nabarite, a native sulphid of mercury, occurring amorphously, when it is black or dark gray, or in tetrahedral crystals. To its black color it owes its early popular name, Æthiops mineral. Metacinnabarite is found in California.

Metagen'esis, or **Heterogony**, a term proposed by Owen for a form of parthenogenesis. It is that form of alternation of generations (q.v.) of which one generation reproduces only asexually, by division or budding, the other exclusively by laying eggs. A good example is the mode of reproduction of hydromedusæ in which the hydra-like stage gives rise to medusæ, the latter laying eggs. Another case is that of the aphides, whose asexual individuals produce multitudes of young by budding, the next generation consisting of males and females, the latter laying fertilized eggs. An individual of the first generation is called the nurse; one of the second generation the sexual animal.

Another term for this phase of reproduction is heterogony (or heterogenesis), which Hertwig defines as "regressive alternation of generations." He mentions another form of heterogony where two generations with different forms and structure alternate. For example, a hermaphroditic thread-worm (*Ascans nigrovenosa*) lives in the lungs of frogs; it produces a form (*Rhabdonema nigrovenosum*) which lives in mud, and which lays eggs giving rise to the ascaris of the frog.

Metal. The elements are usually divided by chemists into two classes, metals and non-metals. Formerly the classification was based on physical properties, and the metals were then elements which were opaque, had a metallic lustre and were good conductors of heat; now the division is made on chemical properties, and a metal is defined as an element which has the power to replace hydrogen of acids and form salts, in other words it is a base-forming element. However, no sharp line can be drawn between the metals and non-metals, since some of the elements belong to both classes. Some metals have a high specific gravity, but lithium, sodium, potassium, etc., float on water, and in general the metals of highest specific gravity are least active chemically. Some 45 elements are usually classified as metals.

A mass of any metal is believed to be composed of atoms arranged in molecules, and any change in the arrangement of the molecule means a change in physical characteristics. Thus crystalline structure may be obliterated by rolling or hammering a metal and by the same means the specific gravity may be increased, since the molecules are forced nearer together.

All metals with exception of bismuth are lighter when molten than when cold. Bismuth, like water, reaches its greatest density just before solidifying. The relative specific gravities of some common metals in the solid and in the liquid state are shown by the following table, compiled by Sir Roberts-Austen:

METAL	Sp. g. of solid	Sp. g. of liquid
Iron (pig)	6.95	6.880
Zinc	7.20	6.480
Tin	7.50	7.025
Copper	8.80	8.217
Bismuth	9.82	10.55
Silver	10.57	9.510
Lead	11.40	10.370

The fracture of metals is not a property but a feature which gives much information about the manner in which it cooled, the presence of impurities, etc., and is of great practical value. Thus foundry iron is graded and sold by its fracture, and in smelting copper and refining lead the decisive points in the processes are determined by the fracture of test samples. Slow cooling, as with chemical solutions, helps the formation of large crystals, giving a coarse fracture, while a sudden cooling may prevent the formation of crystals and thus give a fine fracture. Crystalline structure, which determines fracture, may be affected by repeated shocks or vibrations. In this way the wrought-iron chains on railroad cars to prevent accident in case of a coupler breaking may by the jolting of ordinary service become so crystalline as to break when needed. Very low temperatures, as shown by the experiments of Dewar, also affect in a marked manner the crystalline structure of some metals. Any metal is fusible, though arsenic sublimes at 180° C.; it may be fused under the pressure of its own vapor. When heated, metals give a red and finally a clear white color. The temperatures corresponding to these colors are approximately: incipient red, 525° C.; dark red, 700°; incipient cherry red, 800°; clear cherry red, 1000°; white, 1300°; dazzling white, 1500°.

Certain physical constants of some of the metals are shown in the following table, the figures being from Roberts-Austen's 'Introduction to the Study of Metallurgy.'

METAL	Symbol	Atomic Weight	Specific Gravity	Melting Point °C
Aluminum	Al	27.00	2.56	649°
Antimony	Sb	120.00	6.71	632°
Arsenic	As	74.90	5.67	....
Bismuth	Bi	207.50	9.80	268°
Cadmium	Cd	111.70	8.60	320°
Chromium	Cr	52.40	6.80	higher than platinum
Cobalt	Co	58.60	8.50	1500°
Copper	Cu	63.20	8.82	1083°
Gold	Au	197.20	19.32	1063°
Iron	Fe	55.90	7.86	1600°
Lead	Pb	206.40	11.37	326°
Magnesium	Mg	24.36	1.74	750°
Manganese	Mn	54.80	8.00	1900°
Mercury	Hg	199.80	13.59	—39°
Nickel	Ni	58.60	8.80	1600°
Platinum	Pt	194.30	21.50	1775°
Silver	Ag	107.93	10.53	961°
Tin	Su	119.00	7.29	232°
Tungsten	W	184.00	19.10	higher than manganese
Zinc	Zu	64.90	7.15	418°

The color of a metal depends on its selective absorption of light waves of different wave lengths. Unless the light penetrates the metal, it is reflected and the metal looks white. The selection of light rays may be from several parts of the spectrum; this is the case with copper which has a reddish hue. Anything which increases the absorption deepens the color. This can be done by reflecting a ray of light many times from two or more surfaces made of a given metal. Silversmiths and goldsmiths accomplish the same result by finely grooving a metal surface. Owing to this absorption of light by a metal the color of the light reflected differs from that transmitted. Thus gold can be made so thin that some light will get through. This light is bluish green, while as we all know, gold looks yellow. Silver is white by reflected light, while the transmitted light is blue.

Malleability is the property that permits a metal to be hammered or rolled into sheets. Ductility that which permits it to be drawn into wire. Both are dependent on the tenacity of the metal, the latter more than the former. The relative malleability and ductility of the principal metals is as follows:

Order	Malleability	Ductility
1	Gold	Gold
2	Silver	Silver
3	Copper	Platinum
4	Tin	Iron
5	Platinum	Nickel
6	Lead	Copper
7	Zinc	Zinc
8	Iron	Tin
9	Nickel	Lead

The mobility of the molecules of a metal is increased by temperature. Thus a coiled nickel wire may be made absolutely straight by suspending a weight from one end and heating the wire to white heat by the flame from an alcohol lamp or Bunsen burner. Zinc at its melting point is brittle, but at a temperature of 150° is quite malleable.

Metals can occlude gases. Thus a given volume of palladium cooled from red heat in hydrogen absorbs 900 times its volume of that gas. Hydrogen passes through red hot iron or platinum, and nascent hydrogen, assisted by atmospheric pressure will pass through a thin plate of cold iron as shown by Deville. A liquid metal can penetrate a solid; a bar of tin rubbed with mercury absorbs enough in a very short time to become brittle. A solid metal may penetrate another when both are cold. This can be shown with plates of gold and lead rolled together and allowed to stand.

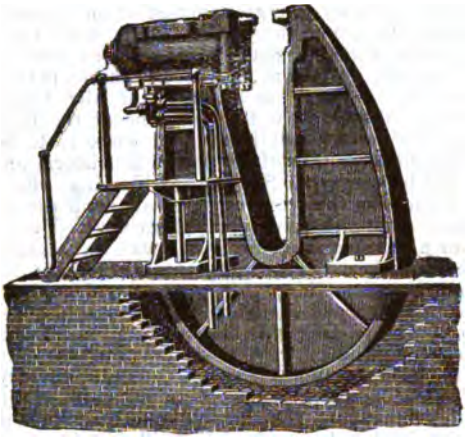
For further information about the different metals, see ALUMINUM; ANTIMONY; IRON; LEAD; SILVER; etc. SAMUEL SANFORD,
Assoc. Editor 'Eng. & Min. Journal.'

Metal Trades Association, The National, an association of 220 firms in the metal trade, organized in 1899, for the purpose of resisting excessive demands of labor. The association will not arbitrate any question after a body of employees have declared a strike.

Metal Work, a form of decorative art in which the materials are metal and the methods casting and repoussé. The term includes jewelry (q.v.) and goldsmith's work; hence its materials are often the precious metals and its end, personal adornment. The more intensive use of the word makes it apply to larger work and especially to metal decoration in architecture, apparently a later development in the arts than was the jeweler's trade, which flourished in classical antiquity, and everywhere seems to have quickly followed the most primary knowledge of metallurgy in industrial evolution. The Middle Ages was the great period of metal work, notably in connection with Gothic art. Even the more valuable metals were lavishly used in this epoch, as before in the Byzantine period, and since in the architecture of the Greek Church, above all in Russia. One of the foremost instances of Italian metal work is to be found in the altars of St. James at Pistoria and of the baptistery of St. John in Florence. Each of these was the work of a line of great artists, whose elaborate work upon them covered more than a century. Cellini (q.v.) was the greatest metal worker of the 16th century. Even more important than this work in silver and gold are the great bronze doors in the Florence baptistery, one by Ghiberti, and another by Pisano, each the product of a score of years of labor and both dating from the 15th century. Wrought iron work began to be used in the 12th century; between the 13th and the 18th centuries in the shape of gates, grilles and screens in ecclesiastical art, and in German locks and hinges of great beauty, it came to its most perfect form. The sepulchral brasses of German, French, and English churches should also be mentioned; see BRASSES, MONUMENTAL.

Metal Working Machinery, a term including practically all machines by which metals are converted into shapes required by modern structural work and the industrial trades. They may be conveniently arranged under the following named classes: Lathes; borers or drills; punches; shears; milling-machines; riveters; drop hammers; bending rolls; rolling machines; presses; planers; saws and special machines.

Lathes are turning machines used to obtain cylindrical surfaces by rotating a bar of metal against a cutting tool. The principal parts are the head stock holding the driving cone and revolving spindle; the tail stock supporting the back centre, and capable of being clamped at any point on the centre line of the bed or frame, and the rest or carriage bearing the tool head. The bar of metal to be worked is fastened to the head and tail stocks and rotated or turned by belts from shafting, or by electric motors, while the rest carrying the cutting tool is moved parallel with the axis of the bar from the surface of which a spiral shaving is removed. These machines are made in a great number of sizes, of which the principal forms may be designated as follows: (1) The Hand Lathe; without self-acting feeding devices for regulating the cutting tool, and in which the operation of turning is performed by hand tools; (2) The Foot Lathe; small and light, worked by the operator's foot and adaptable to work as delicate as that of the watchmaker and jeweler; (3) The Self Acting Lathe; in which the cutting tool is held by mechanical means causing it to move automatically over the object being turned; (4) The Chucking or Face Lathe; for turning cylinders several feet in diameter and many feet in length, such as engine cylinders and the tubing and jackets of large ordnance; (5) The Boring Lathe, used for working on internal cylindrical surfaces. Any lathe may belong to the single geared or back geared type. In the former the machine is not provided with gear wheel attachments to the revolving cone or stepped pulley for regulating the speed of the spindle; while in the latter such attachments are provided.



150-Ton Fixed Riveter.

Borers or Drills.— Boring machines are of two types, the horizontal and the vertical. The cutting tool is an axially rotating spindle designed to bore or drill cylindrical holes. They vary greatly in size and form; in the number of spindles employed and the manner of their arrangement. In boring large holes, either horizontal, vertical or inclined, such as engine cylinders, tubing for ordnance, and hollow shafting, the machines usually have two or more separate spindles clamped in a cylindrical tool head. They are especially useful as reamers to finish holes made by punches, and also to give exact cylindrical forms to the internal surfaces of hollow castings of any kind.

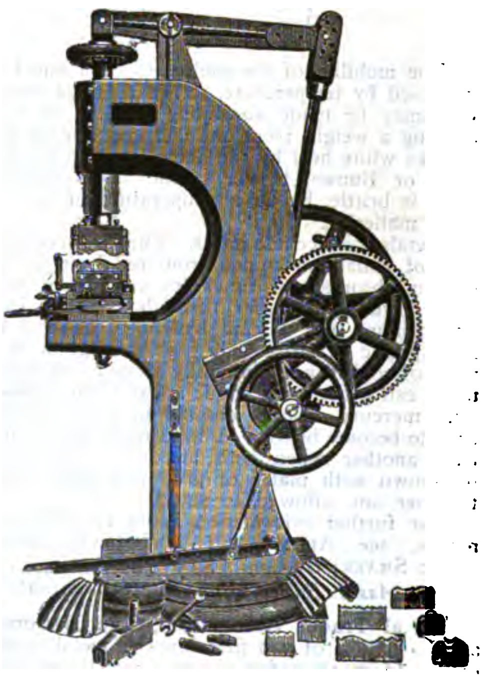
Punches.— Punching machines are of the single or multiple type, capable of punching one or several holes at a time. They are used for punching rivet holes in boiler and armor plates, plates for girders and other structural metal work. The perforation is accomplished by the thrust of a cylindrical punch under great pressure instead of a rotating spindle. The power employed is steam or hydraulic, generated by individual engines for large and belt-driven machinery for small work.

Shears.— Shearing machines and punches are similar in general construction and operation, excepting that in the former cutting edges which pass each other like the blades of a pair of scissors take the place of the punching tool. Their name and action sufficiently describe the purposes for which they are used.

Milling Machines.— Are of great importance in the manufacture of iron work of small dimensions such as the small parts of sewing machines, rifles and pistols. In general construction, a frame-work carries a spindle actuated by a pulley, and a table upon which chucks or holding devices are arranged. Gear-wheel attachments to the cone pulley provide for changes of speed or greater driving power at the cutters. The advantages gained by their use are as follows: The rotary cutters insure a continuous cutting operation; the outlines of the work and the form of the cutting edges are exactly similar; once adjusted, all work is turned out uniform in size and shape, and any unlimited variety of shapes may be obtained by simply varying the form of the cutters, while the only special operating skill required is to maintain the form of the cutters, and set the work.

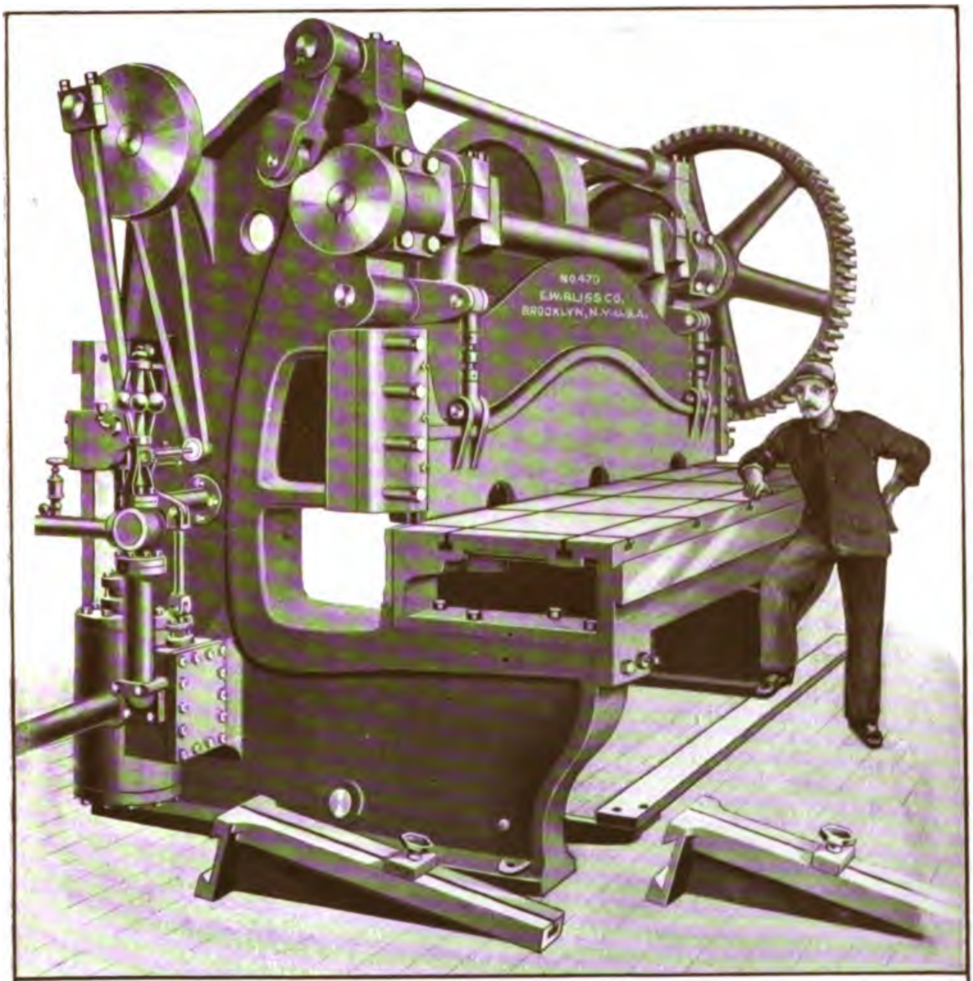
Riveters.— Riveting machines are made in two forms, stationary and portable; the former used in heavy work are operated by steam and hydraulic power, while in the portable form the moving die is actuated by steam or compressed air. They are employed to drive and head hot rivets in boiler work, bridge building and other structural work with results far superior to hand work in rapidity and efficiency. The usual form of construction is a U-shaped frame or yoke. The ends of the arms are provided with dies projecting inwardly, one being fixed while the other has a reciprocating motion. The rivet being placed in the hole is compressed endwise between the dies; the pressure forces the metal of the rivet into the irregular edge of the hole, clamps the plates together and forms the rivet head.

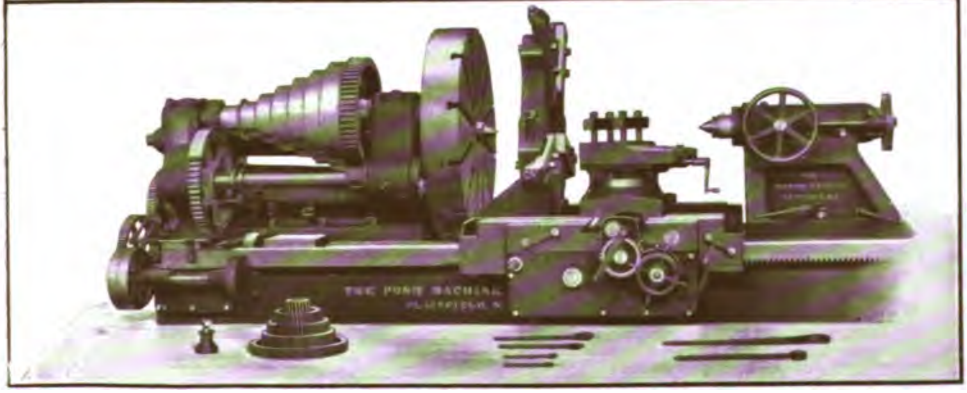
Drop Hammers.— Heavy drop hammers are used for forging purposes and are operated by hydraulic and steam power. They consist of an anvil fixed upon a solid base of steel blocks laid over oak timbers to give elasticity to the machine. Above the anvil vertical housings capped by steel arches support the hammering ram and the platforms upon which the piston cylinder and other actuating machinery is placed. The largest hammer of this kind was erected in 1891 at Bethlehem (Pa.) Steel Works. Its general dimensions and weight are as follows: Height 90 feet; width 42 feet; weight of anvil and foundation 1,800 tons; weight of housings, steam chests, pressure cylinders and piston about 1,000 tons. Ram 19 feet long, 10 feet wide and 4 feet thick, weighing 100 tons. Lighter forms of drop hammers are actuated by compressed air and are called pneumatic hammers. They are used principally as cornice bending machines.



Light Drop-Hammer.

METAL WORKING MACHINERY.



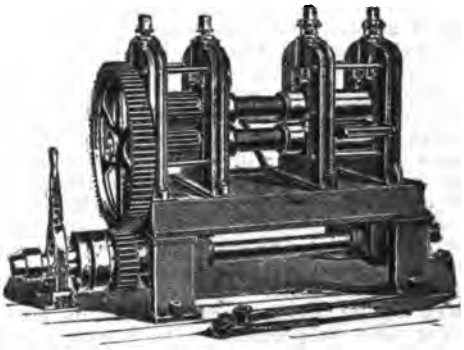


1. Shearing Machine.

2. Seventy-two Inch Lathe.

Bending Rolls and Benders are used generally in boiler and tank work; the metal plates being drawn by rotation between three rolls arranged in the form of a triangle, their relative adjustment determining the curve to which the plate is bent.

Rolling Machines are used to flatten out metal bars into plates and shapes. As designed at present they accomplish in a short space of time a great variety of work which in times past was turned out by the more laborious and expensive processes of lathe turning and forging. One class is used to manufacture boiler and armor plate, and the general run of heavy sheet metal; while another class produces the thin sheet metal down to the finest grades such as tin-foil.



Tin-foil Rolling Mill.

Presses.— By the use of presses shee metal is converted into utensils of any desired form. Their action depends on the principle that fluids exert an equal pressure in all directions, and that, if the pressure applied to the plunger of the force pump be multiplied by the square of the diameters of the plunger and the ram, the product will be the pressure applied to the ram. They are operated by steam, hydraulic or other power; are provided with dies between which the sheet metal is pressed into the required form, and are capable of being constructed to exert an unlimited amount of pressure. Forging presses are made in all sizes adapted for uses ranging from the pressing of watch-cases to the forging of steamship shafts, and ot armor plates weighing 14,000 tons. They are designed for both hot and cold working metals.

Planers.— Planing machines are used to obtain flat surfaces on metal. There are two types; those in which the motion of the table relative to the cutting tool is rectilinear, and those in which that motion is rotary. In general construction a planer consists of a traversing table on which the work is fastened; a bed to receive the table and guide it in a right line; a cross slide to support the slide rest carrying the tool; standards bolted to the bed and supporting the cross slide, and the mechanical devices for feeding and regulating purposes. The power supplied from shafting by belts is transformed by gear wheel attachments into the reciprocating motion of the table, causing it to slide back and forth between the vertical guides, thus bringing the work against the cutting tool which shaves off successively, side by side, narrow thin strips of metal until a perfectly flat surface is produced. Planers are built in various sizes, the larger machines being equipped with tables 7 to 8 feet in width and 20 feet long.

Saws.— In metal working, saws belong to the class commonly termed finishing machinery. For cutting plates and bars into shorter lengths they are in extensive use, affording a great economy of time. They are built in a great many sizes and forms, both stationary and portable, equipped with single cutters or cutters arranged in gangs. For cutting off large bars such as steel beams, rails and similar shapes, saws with single cutters are generally used, the object being fastened to a carriage and moved into contact with the edge of the circular cutter. Some machines used for lighter work are so arranged that the circular saws are moved into contact with the bars. The cutters are of two kinds. The friction disks made of soft mild steel, without teeth, measuring about 44 inches in diameter and 3-16 of an inch in thickness, are used for cutting off either hot or cold metal. They are run at a high rate of speed, about 15,000 feet per minute, rim velocity. The toothed cutters, vary greatly in diameter and thickness; are made of highly tempered steel, and are used for clean cutting in cold metal. They are usually run at a low rate of speed the rim velocity varying from 130 to 150 feet per minute. Friction disks run at rim velocities between 20,000 and 25,000 feet per minute are called fusion disks, from the fact that the intense heat generated by the friction actually melts the metallic dust ground off by the cutter.

Special Machines.— This term includes an almost endless variety of metal working machinery, capable of enumeration only in a very general way. They are used for special purposes such as making pins, nails, rivets, and pens; the tapping of nuts and the threading of bolts. Although often of very complex construction they turn out work with great rapidity and precision. In its special field metal working machinery has not only replaced hand labor in all countries, and especially in the United States, but by its use, accomplishments have been achieved in structural work such as the building of magnificent buildings and bridges, powerful engines, and mammoth ships, far beyond the capabilities of that which is known industrially as hand labor.

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Metalloid (Gr. «metal-like»), in chemistry, any non-metallic element. These are 13, namely, sulphur, phosphorus, fluorin, chlorin, iodine, bromine, silicon, boron, carbon, nitrogen, hydrogen, oxygen, and selenium. The distinction between the metalloids and the metals is slight. The former, excepting selenium and phosphorus, do not have a «metallic» lustre; they are poorer conductors of heat and electricity, are generally not reflectors of light and not electropositive; that is, no metalloid fails of all these tests. The term seems to have been introduced into modern usage instead of non-metals for the very reason that there is no hard and fast line between metals and non-metals, so that «metal-like» or «resembling metals» is a better description of the class than the purely negative «non-metals.» Originally it was applied to the non-metals which are solid at ordinary temperatures.

Metallurgy. Metallurgy deals with methods of separating metals from their ores and of adapting metals to their commercial uses. It had its beginnings when men first wrought the metals; but was long an art rather than a science, in fact only within comparatively recent years has metallurgy had anything like a scientific basis, but to-day it covers a wide range of facts, and the trained metallurgist has a sound understanding of inorganic chemistry, physics and mechanics.

Of all metallurgical processes that of the separation of lead from its ores is one of the oldest. Lead smelting was known to the ancient Hebrews, and Schliemann found silver ornaments on the site of ancient Troy that were so pure as to show that the Trojans knew how to separate silver from lead by cupellation. Lead ores were wrought by the ancient Egyptians perhaps 3,000 years B.C. The ancient Greeks and Romans extracted gold, silver, iron, lead, copper, and tin, and the Romans made brass although they did not extract zinc from its ores. The alchemists of the Middle Ages did a vast amount of experimental work and made important discoveries. Thus Geber in 707 found that a given volume of metallic lead changed to lead oxide shows an increase in weight, but apparently he made little or no attempt to determine the reason for this increase, and like the later alchemists, passed by discoveries that might have been of high scientific value in the search for the fantastic and impossible. It is of interest to note that the study of the action of oxygen and the effects of heat have, more than anything else, extended our knowledge of the metals, that lead has furnished more experiments than any other metal and that the action of oxygen on lead has been more studied by chemists and metallurgists than any other in the whole realm of chemistry.

Metallurgy is the mother of chemistry, but there is to-day no sharp dividing line between the two. Both deal with reactions between elements, and these reactions can be expressed by symbols. Most chemical reactions take place at comparatively low temperatures, generally at or below the boiling point of water, while most metallurgical reactions have to do with much higher temperatures. It is difficult to govern conditions exactly in experiments at temperatures above a red heat, and as a difference of less than 50° in temperature will determine whether or not a given reaction takes place, metallurgical processes have not been developed with the exactness of chemical Again the brilliant results achieved in organic chemistry during the past 50 years and the attention given that branch of science by investigators have tended to keep down the interest in metallurgy. Recently, however, there has been a change, and men of high skill and great knowledge have been investigating metallurgical problems, and much has been accomplished within the past 20 years. The names of Howe, Roberts-Austen, Mathiessen, and Le Chatelier may be mentioned in this connection. Metallurgy like chemistry has benefited by the applications of electricity, and in particular the electric furnace which permits of high temperatures and a fairly close control of conditions has vastly increased the range of experimental investigation. The study of metals and alloys by the microscope has also given a clearer idea of the constitution of metals, their behavior when cooling from fusion, when subjected to stresses, cold, and particularly of the relations of the metals to each other in alloys.

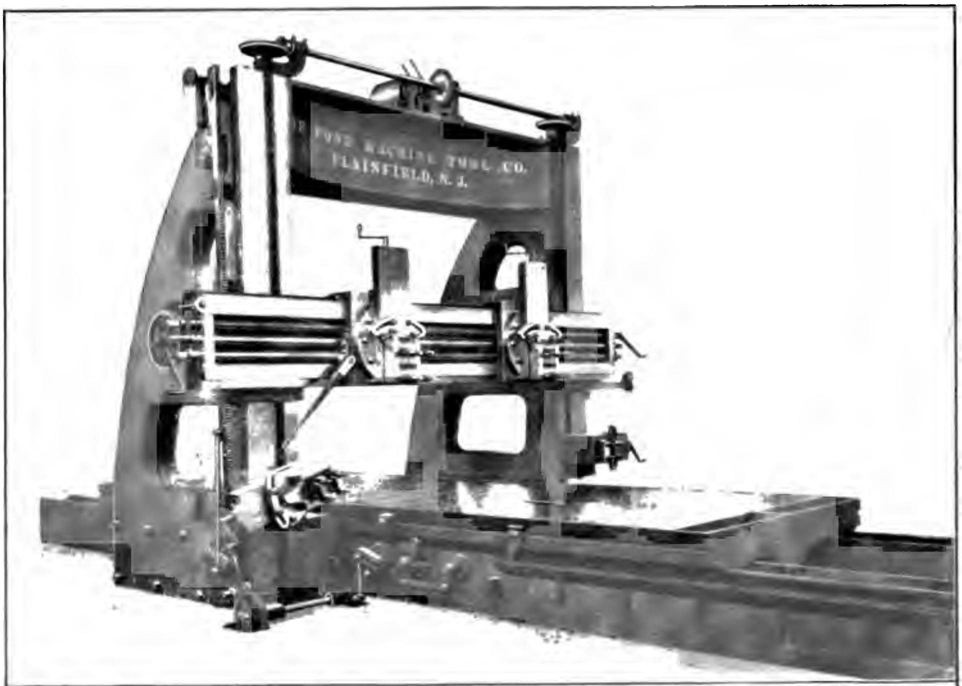
Metallurgy thus covers the separation of ore and gangue, by mechanical methods (concentration or ore-dressing), the reduction of the ore to the metallic state by heat (smelting), or by methods which use electricity (electrometallurgy), the purification of metals (refining), and the study of the composition of alloys by the microscope (metallography). The methods used for the separation of commercially valuable minerals from the waste rock or gangue, and for the reduction of the ores of the various metals, differ and will not be taken up in detail here. Mention is made of them under the metals. (See ALUMINUM; COPPER; GOLD; LEAD.)

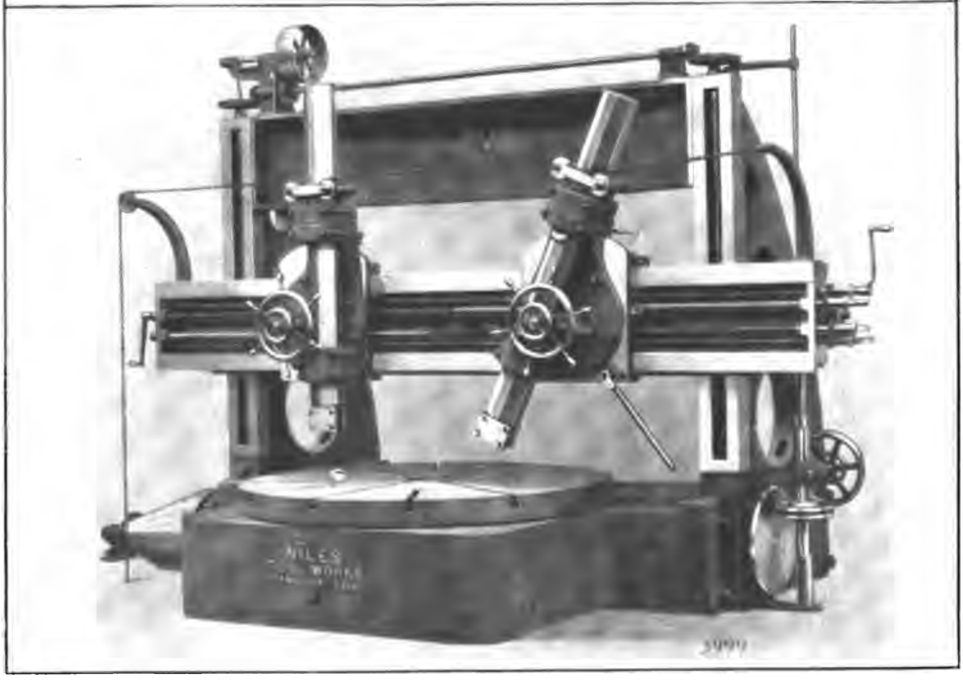
In general it may be said that the metallurgy of an ore depends on the physical character of the minerals and of the rocks in which they occur as well as on the chemical composition of the minerals. Metallurgical processes may be divided into mechanical and chemical. Under mechanical are included the various processes of ore dressing or concentration, the object of which is to separate nearly pure mineral (heads) from what is of little or no value (tailings). In this separation a third product (middlings) is often obtained which may be subjected to further concentration. This separation of mineral from gangue depends on the physical properties of the mineral, generally on its specific gravity, but in certain cases on its magnetism or even on the readiness with which oil adheres to it (Elmore process). The processes which depend on the differences in specific gravity between minerals are divided into two general classes, wet and dry. All the many devices and machines used in wet concentration cannot be mentioned here. In gold mining they include the miner's pan, one of the oldest of concentrating devices; the sluice with cross-pieces or riffles to stop heavy particles of gold, while the lighter clay, sand and gravel are washed over by the water.

In what is called a jig a mixture of heavy and lighter ore and minerals is fed to one compartment of a large box filled with water; by means of a piston a pulsating motion is given the water in the box and thus the minerals in the compartment are stratified, the lighter rise to the top and are removed while the heavier collect at the bottom and are also removed by some mechanical device. Jigs are for separating particles of some size. For the separation of smaller particles (sands or slimes) concentrating tables, or belts of various types are used, the principle common to all being the use of a thin sheet of water which washes off the lighter particles, while by rapid shocks given the belt or table the heavier particles are made to travel against or transversely to the flow of the water, and fall off the table at some distance from the waste rock. Particles of mineral too fine to be caught on tables are separated by running the water holding the fine mineral and waste in suspension through tanks so proportioned that the speed of flow is checked long enough to permit the heavier particles to settle.

Electro-magnetic methods, formerly used only for strongly magnetic minerals such as magnetite, are now, by employing powerful magnets, applied with much success to the separation of minerals differing but slightly in magnetism.

METAL WORKING MACHINERY.





1. Planer.

2. Boring and Turning Machine.

In particular have magnetic methods proved valuable in the concentration of zinc ores, making rich concentrates out of ores that a few years ago could not be worked at a profit. Magnetic concentration is a dry process. Other dry processes depend on differences in specific gravity, a current of air instead of water being the medium used to sort the mineral particles.

The methods of extracting metals directly from the crude ore or from the mechanically separated concentrates fall into three classes: (1) extraction of the metal from oxides, carbonates, etc., by the reducing action of carbon, and the treatment of sulphides by the oxidization of the contained sulphur; (2) the extraction of a metal by getting it in solution and replacing it by another; (3) amalgamation. In the first class come the smelting of all iron, tin, gold, silver, and lead ores. Of replacement methods may be mentioned the precipitation of copper from a solution of copper sulphate by the use of iron, and the precipitation of gold from a solution of its cyanide by the use of metallic zinc. Amalgamation, used in the treatment of an ore containing free gold and silver, consists in bringing a finely crushed ore in contact with quicksilver, when the gold and silver particles form an amalgam with the quicksilver. The progress of electrometallurgy is developing wet processes which aim to separate the metal from the ore by a direct transfer of the metallic atoms or ions.

Most metals are obtained ultimately by the use of heat, either by treating the crude ore or by treating the concentrates obtained by some method of ore dressing. This application of heat may be either for roasting or for smelting an ore. The object of roasting is generally to prepare an ore for smelting by removing sulphur, though it may be the preliminary step, making the ore more porous, to the use of a leaching or lixivation process, such as the leaching of copper ores by a solution of sulphurous acid or the leaching of gold ores by a solution of potassium cyanide. Roasting is done either by piling the ore in heaps with enough wood to start and maintain combustion of the sulphur (heap roasting) or in roasting furnaces. These are of a variety of types but are alike in having means for applying and regulating heat, regulating the supply of air to combine with the sulphur in the ore, and means for mixing and keeping the ore in motion that the reaction may proceed evenly. A perfect dead roast, that is, the complete oxidation of the sulphur in a sulphur-bearing mineral, is seldom obtained. In what is known as chloridizing roasting, the mineral to be extracted is changed to a chloride by adding common salt to the furnace charge.

Smelting is done in furnaces either of the hearth, shaft, reverberatory or closed-vessel types. The commonest type of shaft furnace is the blast furnace used in smelting iron ores. Ore, limestone and fuel are fed in at the top while hot air is forced through openings near the bottom, the molten iron being led off below. In reverberatory furnaces the fuel is burned in a separate fire-box and its flame is made to play over a horizontal hearth on which the ore lies. Some roasting furnaces give a reverberatory effect and do not smelt simply because a high temperature is not used. Reverberatory furnaces are used in smelting lead and copper ores. In closed-vessel furnaces the ore is contained in a pot or similar receptacle made of a silicious clay or other infusible material and the heat applied externally. Furnaces of this sort are used in smelting zinc ores.

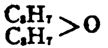
To the ore put in a smelting furnace is often added a certain calculated amount of limestone, iron ore or other material, to act as a flux, that is, to combine with the silica, alumina, etc., forming a readily fusible mixture or slag. This is lighter than the molten metal and floats upon it. Hence the slag and metal can be tapped separately from the furnace.

For the metallurgical processes used with the different metals see ALUMINUM, ANTIMONY, ELECTRO-CHEMICAL INDUSTRIES, etc. Consult also Percy's 'Metallurgy' (1875), and Roberts-Austen's 'Introduction to the Study of Metallurgy' (1902).

SAMUEL SANFORD,
Assoc. Editor 'Eng. & Min. Journal.'

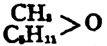
Met'amerism. When two or more chemical compounds have the same empirical formula, but consist of different radicals united by an element (or a radical) that is common to them all, the compounds are said to be "metameric," and the property itself is called "metamerism." The common element that unites the radicals is usually oxygen or nitrogen. Good examples of metamerism are afforded by the compound ethers and amines. Dipropyl ether, methyl-amyl ether, and ethyl-butyl ether, for example, all have the empirical formula $C_6H_{14}O$; but dipropyl ether contains two propyl radicals (C_3H_7), methyl-amyl ether contains one radical of methyl (CH_3), and one of amyl (C_5H_{11}), and ethyl-butyl ether contains one radical of ethyl (C_2H_5) and one of butyl (C_4H_9); the two radicals being connected, in each case, by an oxygen atom. The structural formulæ of these respective compounds are therefore as follows:

Dipropyl ether.



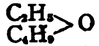
$$\begin{matrix}C_3H_7\\C_3H_7\end{matrix}>O$$

Methyl-amyl ether.



$$\begin{matrix}CH_3\\C_5H_{11}\end{matrix}>O$$

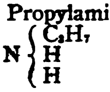
Ethyl-butyl ether.



$$\begin{matrix}C_2H_5\\C_4H_9\end{matrix}>O$$

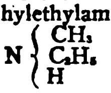
The following amines, which all have the empirical formula C_3H_9N, illustrate metamerism in which nitrogen is the connecting element:

Propylamine.



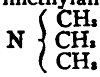
$$N\left\{\begin{matrix}C_3H_7\\H\\H\end{matrix}\right.$$

Methylethylamine.



$$N\left\{\begin{matrix}CH_3\\C_2H_5\\H\end{matrix}\right.$$

Trimethylamine.



$$N\left\{\begin{matrix}CH_3\\CH_3\\CH_3\end{matrix}\right.$$

Metamerism may be regarded as a species of accidental isomerism. When metameric compounds are treated with reagents which destroy the bonds between the constituent radicals and the atoms (of oxygen or nitrogen) by which they are united, the several members of the metameric group that is so treated yield totally different products, because they contain totally different radicals.

Metamorphic Rocks, in geology, those rocks whose present form is the result of far-reaching and extreme change, the most frequent metamorphosis being an increase in hardness and in crystalline formation. Thus, both volcanic and sedimentary rocks have been greatly altered. Metamorphic igneous rocks have the original textures characteristic of igneous rocks partially obscured by fissile planes. Metamorphic sedimentary rocks have more clearly the character of the unaltered original in composition; and they furnish the commonest examples of metamorphism, namely slate, an altered form of argillaceous rocks, and marble, a metamorphosed limestone. The third class of metamorphic rocks is that whose origin is not clearly traced. See METAMORPHISM.

Metamor'phism (Gr. «alteration»), a lithological change, especially chemical alteration and rearrangement, exclusive of the chemical change due to atmospheric action, the product of which is styled residual and not metamorphic. Metamorphism is a more profound change than that effected by decomposition or weathering. Its nature is uncertain, but its result is in general an increase in hardness and in crystallization. See METAMORPHIC ROCKS.

Metamorphism is «contact» or «regional.» Contact alteration is due to the near presence of intrusive rock, usually igneous; in this way it is supposed that shales and slates were metamorphosed from argillaceous matter. Regional alteration is the result of movements of the rocks changed and of the areas they occupy; hence it is frequently styled dynamical metamorphism. Under this influence the rock passes through various stages, first hardening, and then becoming crystallized (or re-crystallized), usually with increased schistosity. See GEOLOGY.

Metamor'phosis in Animals, the changes which in many animals take place between the time of birth and maturity. The causes are most probably changes of habitat, of seasons, of food, and the acceleration in growth resulting from the approach of sexual maturity. Familiar examples are the change of the caterpillar into the butterfly, of the tadpole into the toad or frog.

In the frog and toad, metamorphosis is complete and thoroughgoing. The embryo on hatching from the egg has a large head and body, but no tail; in a few days its tail grows out and it becomes a tadpole, when it is fish-like, but without fins or limbs. With the growth of the tail, the external gills appear, and the mouth is formed, while the intestine becomes very long and closely coiled. The mouth is armed with horny, comb-like plates, on which develop great numbers of microscopic teeth, which are shed continuously. In changing from the tadpole to the toad or frog, the body, including the skull and rest of the skeleton, and the viscera are made over anew; the external gills disappear as the lungs develop, the true teeth appear in the jaw, the intestine becomes short and straight, and the creature instead of nibbling decaying leaves or dead animals, feeds on living snails and insects. Soon the front legs bud out, the tail becomes absorbed, finally the hind legs grow out, the gills disappear and the adult form is attained. While most amphibia pass through such a metamorphosis, in a few forms, owing to the absence of water or other changes in the environment, development is direct, the metamorphosis being suppressed. Metamorphosis may be retarded by cold, and shortened by hunger, and in the amphibians or in insects the changes are greatest in modern and specialized forms, as frogs and toads.

The metamorphosis of the butterfly is the most complete of those of all insects. The life of the insects is divided into four stages, that is, the egg, larva, pupa, and imago or adult. During the larval and pupal periods the insect is, so to speak, a different animal from the adult. The caterpillar is provided with big jaws and eats voraciously; in shape and structure it differs widely from the winged adult. The pupa or chrysalis is also different from the larva, and also from the imago; it takes no food and rests almost motionless. On the other hand, the butterfly has no jaws, while its maxillæ form a long coiled up tongue beautifully adapted for probing the corollas of flowers. Though these changes appear to be sudden, the internal alterations of cells and tissue which lead to them are gradual. From one to three days before assuming the pupa state the caterpillar becomes restless and stops eating. If a spinner it spins a cocoon, or if not it enters the earth to undergo its transformation into a chrysalis, or if a larval butterfly it attaches itself to some fixed object as a tree or fence. Profound changes now take place in the mouth-parts as well as the nervous, muscular and other systems of internal organs.

But the changes are most marked in the flesh flies and their allies. At the end of the maggot-stage, the internal organs are destroyed, breaking up and forming a creamy mass, and the appendages and wings arise from minute internal masses of cells called «imaginal buds» which are present in the maggot. The body is thus entirely made over anew. But while the process of destruction of the larval organs and appendages goes on, there is also a constructive process, during which the organs of the adult state are being built up. It is thus evident that the sharp division of the life-history of the insect into larval, pupal and imaginal stages only applies to the external surface of the body. The internal processes of development, on the other hand, form a continuous series of transformations between which is no sharp line of demarcation. Yet as a whole the forms of the larva, pupa, and imago are kept distinct in adaptation to their separate environments and habits.

Hypermetamorphosis.— This name is applied to the changes undergone by certain beetles (*Meloë, Stylops,* etc.), in which there are more than the usual number of larval and resting or pupal stages. Thus in the common oil-beetle (*Meloë*) and in the blister-beetles (*Epicauta*) the larva hatches as a minute, active, triungulin creature which is a parasite in bees' nests, feeding on their eggs; it passes into a second larval stage, when it is grub-like, inactive, the body being thick, cylindrical, soft and fleshy; this passes into a motionless semipupa, and thus after molting assumes a footless larval form; it then transforms into a true pupa like that of other beetles. There are thus four distinct larval stages, besides the pupa and beetle. Now these stages correspond to the habits and food of the young beetle, and these supernumerary stages and marked changes of form are evidently due to changes of environment, of habits, and of food, resulting in the atrophy of limbs in certain stages. This throws light on the causes of metamorphism in general.

Nc Distinct Metamorphosis in the Primitive Insects.— The wingless insects (*Synaptera*) do not pass through a metamorphosis. And it appears, as first suggested by Fritz Müller, that the habit of metamorphosing is an acquired one. Thus in the more primitive winged insects, such as the cockroach, grasshopper, bugs, etc., metamorphosis is incomplete, the young differing mainly from the adult in not having wings. Also the most primitive arthropod animals such as the horse foot crab (q.v.), the spiders and myriapods, pass through no metamorphosis

Metamorphosis in the Lower Animals.— The more specialized cœlenterates (*Medusæ*), the echinoderms, mollusks and crustaceans, as well as many worms, undergo remarkable changes of form. (See LARVA.) The larva of the marine annelids is a top-shaped ciliated creature (*trochosphere*) entirely different from its parent. The marine mollusks pass through a larval condition (*religes*). The young of the sea-urchin, starfish and holothurians differ remarkably from their parents in being bilaterally symmetrical, transparent, and free-swimming; they serve as scaffoldings from which the body of the adult is developed. The shrimps, etc., are hatched in a nauplius or six-legged form, and crabs in a zoëa form.

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Met″aphosphor′ic Acid. See PHOSPHORIC ACID.

Metaphysics. Metaphysical reflection began with Parmenides of Elea, who, not finding the phenomenalism of the Ionians, or the more formal reflection of the Pythagorean School, satisfactory, was led to deny the reality of the whole world of appearance and to penetrate deeper in his search for the real. In doing so he observed that while the objects of sense are always changing, it is the very essence of thought that it should seize its object as a place of rest and deal with it as a fixity. Τὸ ὄν then, or being, is the permanent and the one. Metaphysically, the world is static and unitary, and the vision which the senses give of it as a plurality of phenomena in a state of incessant motion and change, is illusion. Zeno, another member of the school, developed his dialectic in order to prove the self-contradictoriness of plurality and motion. Plato is at one with Parmenides in regarding being as the object of thought, and as therefore fixed and static in its character. But Plato has also learned the lesson of «becoming» from Heracleitus, and meets the destructive dilemmas of the latter by affirming that being is not one but many, and that the world-process to which Plato ascribes a degree of reality arises from the introduction of the stable or determinate world-elements or ideas into a formless matter, or ὕλη, which stubbornly resists the form-giving principle and thus gives rise to the movement or process of the world. But Plato is still so far in bondage to the Eleatic tradition that he regards the ideas, or metaphysical reals, as eternal archetypes prior to the individual beings of the world, and only entering into these beings under the pressure of some *Deus ex machina*. Thus, in the 'Timæus,' he represents his Demiurge as compounding things out of the ideas as patterns, and the resisting and formless matter. Aristotle overcomes the Platonic dualism by an act that completely emancipates him from the Eleatic tradition. He translates Plato's ideas into forms, endows them with dynamic quality and conceives them to be the immanent principles of the world's order and movement. He is then able to translate the notion of being into terms of becoming, without depriving it of its fixed and stable character. The world of Aristotle is just as much a flux as that of Heracleitus, but Aristotle has an intuition which the older thinker lacked. He sees that the flux itself is not lawless, but in a sense predetermined, as a passage from the potential to the actual. There is an inner nature of things which constitutes their immanent destiny, and this going on to realize itself determines the whole constitution and process of the world. From this point of view all the terms of Aristotle's metaphysic are to be construed. Matter is simply the world-system regarded as a possibility; form is the same system as actual. Δύναμις, potentiality, expresses the material aspect and the material elements of things; ἐνέργεια, potentiality realized, their actuality, life and movement. The four causes are simply the sum total of conditions material and formal which determine the passage of things from mere potency to actuality. God is the immanent nature, the spring of self-activity, that mediates and determines the world-evolution from the potential to the actual. He is the completely actualized world.

It may be very truly said that the metaphysical intuition of the ancients completed itself in Aristotle. Neo-Platonism contains no real advance on old Platonism, and the mediæval metaphysic that culminated in the system of Saint Thomas does not in any important sense transcend that of Aristotle. In modern times the first real effort toward metaphysical advance is found in the thought of Spinoza. This celebrated thinker is the first to effectually call in question the metaphysical presumption of the ancients that the real is the immediate object of thought. Spinoza rebels against the dualism that represents the real as composed of thoughts and things corresponding to them. He proposes that there shall be only thought and its content. For Spinoza does not identify his two terms in the sense that he regards thinking and being as identical. The world of Spinoza is static, non-dynamic; and the two aspects of it, as he sees it, are (1) thought, regarded as a form of intellection; (2) being, regarded as the immanent object, that is, the content of intellection. God or *Natura naturans* is the world viewed from the standpoint of intellection; Nature or *Natura naturata* is the world viewed objectively as the content of intellection. As objective content, it is manifestation or outer phenomenon; as subjective thought or intellection, it is inner nature or God. If we add to this the fact that the thought of Spinoza is universal rather than individual, we will have noted all the essential terms of his metaphysic which may be characterized as a species of Pantheistic Monism. What is most distinctive in the thought of Kant is his definite and final occupation of the standpoint of epistemology, as the true ground for the determination of the problems of metaphysics. Now in so doing, Kant is making thought the measure of reality, and this seems to be only repeating the judgment of Spinoza. But there is a great difference. Kant declines to accept Spinoza's doctrine of thought and reality. The real is more than the content of thought. In fact Kant returns to the ancient intuition of thought as formal, and the real as in some sense its correspondent. This was also the tradition of Locke and his school, from which Hume departed, and fell, as a result, into skepticism. Now the history of Kant's thought shows that, while he clung to the belief in the mere formal character of thought, his tendency was also strongly in the direction of skepticism. Moreover it was on account of his failure to completely achieve what he calls his Copernican revolution, and which was in fact a reaction toward a constitutive doctrine of thought, that he was never able, during the whole of his critical period, to reach a satisfactory conception of the relation of thought to reality. Had Kant completely achieved the mental revolution he proposed, the result would have been, that in epistemology he would have reasserted the doctrine of Spinoza, the identity of the real with the content of thought. The knowable world would thus have been identical with the real world and Kant would have escaped the dualism between knowledge and reality into which he actually fell. Kant also denies the universality of thought; at least in the ontological sense. The thought that functions epistemologically is my human relative thought which can only pronounce judgments that are subjectively valid for me, but have no ontological value for reality. The Kantian metaphysics is a corollary from his epistemology. What Kant calls critical idealism is first an epistemology, secondly a metaphysic. As an epistemology it teaches that my thought is constitutive for me; that is, that its content is valid for my subjective connation. It gives me a world, in other words, in which I can work out the practical issues of my life, but it does not give me the world of real things in themselves with respect to which my attitude must be one of renunciation. As a metaphysic critical idealism simply carries its programme out in the field of ontology. The presumption of the identity of what is thought with the real cannot be carried out objectively. Kant's metaphysics is therefore necessarily negative. Thought is able to complete itself ontologically, it is true, but the ideals it reaches have no other than subjective value. Their hypothetical content can never be identified with the real, and the Kantian is per force obliged to represent the whole ontological region as an indeterminate X and to look for the satisfaction of his wants to extra-metaphysical forces. In Hegel we have also an example of a thinker who approaches metaphysics along the epistemological way. But Hegel is a much more thorough-going thinker than Kant. He starts no doubt with the Kantian traditions in mind and his first great task, the development of his logic, is formal. But Hegel is not a formal thinker, in the sense that he divorces content and form. Thought is formal. This Hegel is not afraid to confess, but it is also ontological. At the same time there are no outlying realities, like the Kantian things in themselves. How is this? Are we to have the spectacle of a lapse into Spinoza? Our apprehensions are ungrounded, for Hegel asserts calmly that the form creates the content. Hegel asserts the identity of thought and reality in the sense that the real is, and is only, what the thought thinks it to be. It is the real by virtue of the thought thinking it to be. This sounds like a dangerous kind of subjectivity, till we learn that by thought Hegel means, not my thought or yours, as simply my or your intellectual function, but the thought that is universal and that thinks the universal. So much for Hegel's epistemology. In Hegel's system epistemology and metaphysics are simply two aspects of the same thing. In epistemology we have the system logically conceived; that is in view of the process which the finite thought of the individual must pass through in order to apprehend it; whereas in the metaphysics we have the system presented in its unity as a self-completing whole. Epistemologically the dialectic is the movement by which results are achieved; metaphysically it is the Divine Spirit of the system as a whole. After Hegel there is no other thinker of great metaphysical significance, except Lotze, in whom we have a reversion to the Kantian tradition in regard to the formal character of thought. Like Kant, Lotze is primarily an epistemologist, and he adheres to the formal character of thought in the Kantian sense; that is, in the sense of Kant's actual achievement in which the Copernican revolution is left incomplete. Lotze not only asserts the formal character of thinking, but also more distinctively than did Kant, the distinctness of the order of thought from the order of things. The great question in epistemology for Lotze is, how the order of thought is to be made valid for the order of things. Now we are directly concerned with epistemology here, and can only stop to indicate that this is to be achieved by a kind of breaking in of the real order on the order of thought at various points; in short by the working of an epistemological miracle. It is true that Lotze attempts to buttress his miraculous intervention with the *a priori* necessities of thought itself; an attempt which supplies an interesting topic for criticism. The nexus between the Lotzean epistemology and metaphysics is to be found in the conclusion of the former; namely, that the order of thought may be taken as valid for the order of reality and consequently thought may be employed as an agent of metaphysical judgments. From this point the Lotzean metaphysics may be summarized as follows: Starting with Kant's doctrine of things in themselves, Lotze is dissatisfied with their negative and indeterminate character. This leads him back of Kant to Leibnitz in whose monads he finds conceptions of reals which have a determinate nature and which are, therefore, to some extent knowable. Fundamentally, however, this monadology is a system of pure pluralism. The reals are independent and relationless. Leibnitz is nowhere able to overcome the atomism of his system. Now Lotze, in adopting the Leibnitzian real, modifies it by conceiving it, after the analogy of sociality, as internally susceptible to modification from its fellow reals. The form which this susceptibility takes is the dynamic one of interaction. Out of the mutual and reciprocal interactions of the metaphysical reals emerge all the movements and changes that make up the phenomenal world. Lotze also qualifies the pluralism of Leibnitz by postulating, as the necessary ground of the existence and unity of things, a universal substance or unitary being, which supplies the absolute term in the metaphysical conception of the world. This absolute is open to two criticisms that may be simply indicated here. Ontologically it threatens a return to the Pantheism of Spinoza, while epistemologically it is in danger of succumbing to the pluralism for which it was postulated as a cure.

II. All metaphysics arises out of the question whether thought is adequate to the apprehension of reality. This question may be answered either negatively or affirmatively, and each of these answers will have two generic forms. The negative answer will take the form either of skepticism or agnosticism, while the positive answers may be characterized as materialism or spiritualism. The first form of negation, skepticism, will arise either directly out of a dogmatic denial by reason of its own powers, or, as is more often the case, from the standpoint of sensationalism. In general, it may be said, that ancient skepticism was dogmatic; while modern forms are as a rule sensational. Thus, the earliest form of skepticism on record, that of Heraclitus, arose immediately out of the perception that a system of perpetual flux supplies no points of sufficient stability for the judgment, so that while being pronounced it loses its ground. Could Heraclitus have discovered a single point of rest in his world he would have been in a position to become a positive thinker. The early Sophists became skeptical because they had lost faith in reason. The first proposition of Gorgias was that nothing exists; meaning, that our thought or reason supplies us with no rational data for asserting anything to exist. The other propositions of his negative creed depend on this ontological pronouncement and have little relevancy apart from it. Coming down to Pyrrho and the later skeptics of the Academic School, we find that their skepticism, while differing in degrees, has this one point of agreement that the object of its denial is the ontological value of thought or reason. Thus, while Pyrrho seems more radical in his negations than the Academic of Cicero's time, the reason is psychological rather than metaphysical and is to be found in the development of the category of probability which came gradually into vicarious service for reason. The judgment of probability thus gradually asserts itself as an organ of certitude, and we find Cicero restating all the Platonic proofs of immortality in order to establish its probability. Modern skepticism, of which that of Hume may be taken as representative, springs directly out of sensational soil. Hume asserts that all real data of knowledge are sensible; consequently reason, which professes to go beyond sense and assert the metaphysical, is a faculty of illusion. Metaphysics is therefore a science of illusion and the judgment of reason is valueless; except so far as it can find its guarantee in the data of sense. The Humian, as a rule, becomes sceptical of reason for its own sake; but the ground of his denial of the value of his ontological judgments will be to seek in his already adopted sensational criteria of reality. There are modern forms of metaphysical skepticism that do not spring directly out of sensational soil, as for example that of Kant which finds its immediate motive in the inevitable self-contradictions into which reason is said to become involved in dealing with metaphysical issues. Kant, however, is not to be ranked as a skeptic, but rather as an agnostic. The term Agnosticism, as well as the thing it signifies, is a distinctive product of the modern mind. It could arise only after a critique of recognition had shown that dogmatic negations of an ontological character are without value; in other words, that no *a priori* limits to existence can be determined. Having reached this insight the agnostic is the one who finds, in this inability of reason to determine the negative limits of existence, evidence of its inability on the positive side to determine the nature of existence. The starting point of agnosticism is thus epistemological; it is primarily a question of knowledge, but in the last analysis its motive is metaphysical. Agnosticism is a name for the denial that metaphysical reality can be satisfactorily asserted. In modern thought it has taken two forms; the one, which has allied itself with Positivism, taking the radically phenomenalistic ground that neither the existence nor the nature of what Mr. Lewes has styled the suprasensible can be affirmed; the other form being that of Herbert Spencer and his school, in which the existence of the metaphysical is asserted, but the possibility of intelligently defining its nature is denied. Of this species of negation Kant is the progenitor in the general position which he develops in the third section of his great work, the 'Critique of Pure Reason.' Here he maintains the necessity of postulating in thought the existence of the metaphysical objects, while denying to such postulates ontological validity.

On its positive side metaphysics has tended to be either materialistic or spiritualistic. Metaphysical materialism is a theory that admits the competence of reason to determine the ultimate nature of the real. Its distinctive feature is its assertion that the original type of being to which the world is to be reduced is to be found in the object rather than in the subject, in matter rather in mind. Such a doctrine may be crudely phenomenal, like the hylozoic theories of the Ionians. It may be ontological and mechanical, like ancient atomism and its modern counterparts, in which the attempt is made to conceive the mechanical evolution of the world out of the movements of the pure material elements. Or it may find its objective term in the nervous system and its metaphysics be a postulate of brain psychology. On whatever data it essays to build, matter rather than mind will supply it with its ontological categories and types of being. Thought, wherever it may show itself, will not be regarded as a *vera causa* but rather as a phenomenon or even an epi-phenomenon of the material. The modern forms of materialism are more subtle than the ancient, and they are less dogmatic in their tone; this result arising partly no doubt from the confessed inability of a materialistic metaphysics to deal rationally with many of the vital concerns of humanity.

Materialism stands, on the whole, discredited before the bar of modern thought. The insight of the modern mind is one that owes more to Plato and Aristotle than to Democritus. Its metaphysical systems have for the most part been spiritualistic, if we use that term in the broad philosophical sense. Now we have defined materialism in the light of its ontological character, and spiritualism may be defined in the same way as a metaphysical construction of the world that seeks its ultimate categories and types of being in mind rather than in matter. The first genuine spiritualistic insight which the history of philosophy records is that of Anaxagoras, who finds in thought or intelligence the only principle that can supply an adequate explanation of the order and unity of the world. This germ is developed by Socrates, Plato, and Aristotle into a system of thought that may be called spiritual idealism. Modern spiritualism has embodied itself in both realistic and idealistic forms. Under the former we may note, first, Scottish realism, in which on an intuitional epistemology, a spiritualistic metaphysics of a pronounced theistic type is built; secondly, the German school of transcendental realists beginning with Herbart and completing itself in Lotze. This school, as we saw in another connection, rests on a Kantian epistemology, but through the mediation of the Leibnitzian monad achieves a thoroughly spiritualistic metaphysic of reality. The idealistic forms have played, on the whole, a more important role in modern thought than have the realistic. Space will permit only a brief mention of three of these forms. First, Berkeleyanism, which proceeds from the empirical epistemology of Locke to a spiritualistic and distinctively theistic metaphysics; secondly, the movement called transcendental idealism starting with Fichte's moral egoism and culminating in the absolute idealism of Hegel, a system in which epistemology and metaphysics are related to each other as thought and content. Later developments of Hegelism have received the name of speculative idealism, a rubric under which it is possible to include such diverse thinkers as Edward Caird, F. H. Bradley, and Josiah Royce. The third form is that of Schopenhauer and may be called voluntarism. This form finding its types and analogies in will, rather than in thought, leads to a metaphysical doctrine of the world, in which the will holds a central place. The voluntaristic type of idealism is one that tends either toward the metaphysical ideal indicated; or setting aside the distinctively metaphysical motive, it may under the name of Pragmatism seek to construct a theory that will combine the purely phenomenalistic with the practical.

III. Attention has been called above to the widespread negative attitude that has been taken, in modern times especially, toward metaphysics. This has been caused partly by the despair of philosophers of ever arriving at results on which men could come to definite agreement. This despair has been reinforced from the outside by the wholesale denial of the value of metaphysics that has been indulged in by men of science. We are not concerned with this situation further than to call attention to it, and to infer from it the possible necessity of developing a concept of metaphysics that will make the connection of the metaphysical enterprise with experience, and with the investigations of science, more obvious than they have been made by the older conceptions. Let us start with the presumption that neither science nor metaphysics exists by any divine right, but are instruments which man employs in order to satisfy his demands and interpret his experience. Man finds himself related through his experience to a world which he seeks to penetrate by his intelligence and overcome by his will, in order that it may become the means of the realization of the ends of his existence. This struggle antedates both science and metaphysics. And as the physical needs are most clamorous, the first efforts will be devoted largely to their satisfaction; and it will be only through the physical struggle for existence that man will begin to recognize himself as a subject of spiritual experiences and needs. Naturally, then, the first need of man in order to supplement his ordinary experience will be science that will enable him to increase his command over the forces and resources of nature. But just as the physical struggle awakes the spiritual in man, so the effort of science to penetrate the physical secrets of nature will lead to points where the physical will be transcended and the necessity of the spiritual interpretation will assert itself. In order to show how normal the demand for the metaphysical is, it is only necessary for us to realize clearly the standpoint and method of its rise. To this end, let us consider briefly the points of view, categories and methods employed respectively by science and metaphysics. Reverting to our representation of man as a being who seeks through his experiences to penetrate and overcome his world, we find, by considering his situation, that there are at least two points of departure from which he sets out to actively overcome his world. The first and most obvious is the external and objective in which, taking the position of an observer or spectator, he observes the movements of his world, with a view to generalizing them and, through these generalizations, getting command of the underlying forces or agencies of which the movements are the phenomena. Now this standpoint is the identical one occupied by science, and the presumption with which it sets out is that of non-community of nature between the investigating subject and the object investigated. In other words, the consciousness that observes the object must be careful to abstain from any and every assumption that the nature of its object may be conscious like itself. The investigator must, in short, restrict his activity to observing the conduct or movements of things in their pure externality, uncolored by any presumption as to what the things they manifest may be in themselves. The most obvious categories in this stage will be those of space, time, and motion and the method will be physical and mechanical. As the scientific construction advances the necessity for something deeper than this will, of course, arise. The motions of things, of themselves, are mere phenomena until they have been connected by the notion of cause, to the persistent but hidden agencies to which science applies the term forces; or in their aggregate, matter. In short, science, in order to justify its own procedure, must at a certain point rationalize its world by connecting the outer movements, with which it deals directly as symbols or phenomena, with a system of underlying grounds or forces. These forces themselves will be construed, however, by science as physical, therefore as spatial, and their relations will be quantitatively, that is, purely externally and mechanically, conceived. Science will thus end as she began, an instrument for the interpretation of the world in the terms of the physical. And this character will be maintained even when the object investigated is mind itself, for then the psycho-physical parallelism will be introduced as a means of translating all mental phenomena into physical equivalents.

In all this effort to explain its world, however, the subject has abstained conspicuously from the employment of its own analogies in the interpretation of its world. We are led naturally to ask, is there not a legitimate and necessary function somewhere for these analogies to perform? and our question leads to the discovery that there is another point of view in experience, beside that from which man spectates his world, and that is the central standpoint in consciousness, from which his consciousness goes out in its volitional effort to overcome and realize its world. The effort here takes the form of the agency of a conscious self and this agency embodies itself in teleological rather than mechanical form; that is, in a process that is motived by an ideally formed interest, which, through the mediation of purpose, passes on to the realization of an end. This end is the ideal embodied in the purpose, and conceived in the ideally formed interest. A man has only to study his self-activity, as involved in his volitional agency, in order to realize the truth of this description. Now, just as we saw that science seizes upon the standpoint of outer observation, and translates it into an organ for the physical interpretation of the world; so here metaphysics lays hold of this inner movement of realization and translates it into an organ of spiritual interpretation. And, as science employs the analogies of the physical alone, on the assumption that the object is alien to the nature of the consciousness, so here metaphysics employs the analogies of the spiritual, on the presumption of a community of nature between its object and consciousness. The standpoint of metaphysics is, then, that of the inner conscious effort that springs directly out of our self-hood. The categories of metaphysics are those of idea-purpose, and end-realization, and it is of teleological rather than mechanical interpretation.

Having indicated as briefly as possible the most characteristic features of what we call the metaphysical interpretation of things we are in a position to consider two questions: (1) the real connection of science and metaphysics; and (2) the relation of metaphysics to general philosophy. As to the first question, the relation of the two disciplines is so obviously not one of conflict or mutual exclusion, but rather of complement and mutual completion, as to give to the persistent blindness that reigns in some quarters a certain air of absurdity. The foes that are being girded exist only in imagination. But seriously speaking, the motive of metaphysics is that and that alone which animates any serious-minded man when finding the physical world too narrow and cramping, in his effort to achieve an interpretation of things that will leave more scope and freedom for the realization of that which he cannot but deem highest, uses as a key to this interpretation the categories of a nature that lives and consciously aspires in his own breast. Man needs the metaphysical interpretation, whether he be consciously a metaphysician or not; and the man of science, if he be gifted with reflective powers and some insight into experience, will be the last to cast a stone at a discipline for which he so clearly prepares the way. (2) The relation of metaphysics to general philosophy may be expressed in various ways. In the first place by way of inclusion; philosophy embraces epistemology as well as metaphysics. Or if we have regard to the disciplines ordinarily included under philosophy, then metaphysics will find itself in company with psychology, ethics, logic, æsthetics, and the philosophy of religion. Here, however, the vital category is not inclusion but synthesis. The comparison of the aims and methods of science and metaphysics teaches us that neither alone is adequate to meet the demands of man or to completely interpret the world. The demand of knowledge, as well as the demand of our practical interests, is for a synthesis of the insights, methods, and results of science and metaphysics. This synthesis, in which the unity of knowledge and life is realized, is the function of philosophy. True philosophy conserves the needs both of science and metaphysics.

In view of the skepticism with which they are often met, the central task of metaphysics becomes that of enforcing the legitimacy of its own interpretation. So long as the claims of metaphysics are debated in connection with the abstract questions of existence and reality or universality and individuality, there may be difficulty in maintaining them against the objections of either science or common sense. Let us, however, set out by understanding the demand for the metaphysical interpretation of things arises in the experience of both the plain man and the man of science, and that it takes the form of a refusal to be satisfied with a world in which the first as well as the last issues are strictly and fatalistically determined by material forces and agencies; in short, with a world from which forethought and will are rigidly excluded. This refusal rests on man's conviction that it is in this field of conscious thought and will-determination that the most vital interests and most fundamental issues of his being arise, and that to those a mechanically-determined world would be indifferent, if not inimical. Once convinced of this, the mind of the most determined foe of the traditional metaphysics will be prepared to admit that a very natural and legitimate interest attaches to the question whether the scheme of world-interpretation may not be so enlarged as to include the problem of the co-ordination of the two spheres of experience: that of material and mechanical agencies on the one hand, and that of the agency of forethought and purpose on the other. If the legitimacy of such a consideration be conceded, the whole problem of metaphysics is on our hands, for the claim of metaphysics is simply that an adequate conception of things is one in which forethought and purpose are to be regarded as necessary presuppositions of the material and mechanical. In view of this we may add to Mr. Bradley's definition of metaphysics as "an unusually stubborn effort to think clearly," this other that metaphysics is an unusually stubborn refusal to admit the adequacy of a world-theory that does not refer the world in the last analysis to forethought and purpose.

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Metar'gon, a gaseous substance obtained, apparently from the atmosphere, in the experiments of Ramsay and Travers upon argon and krypton (qq.v.). It was for a time believed to be a new element, but was later shown to be merely carbon monoxid, which had been introduced by the unsuspected presence of carbon in the phosphorus that they had used for depriving the air of its oxygen.

Metastasio, Pietro, pē-ā'trō mä-täs-tä'zē-ō (properly PIETRO TRAPASSI), Italian poet: b. Rome 6 Jan. 1698; d. Vienna 12 April 1782. His poetical talents were early displayed in improvisations, and often he drew about him a crowd to listen to some versified narrative. The jurist Gravina, who thus accidentally became acquainted with his talents, took him under his protection, called him (by an Italianized translation of his name into Greek) *Metastasio,* paid great attention to his education, and on dying in 1717, left him an estate of $20,000. On 15 April 1718 he was received into the Arcadian Academy with the name of Artino Corasio, and in 1720 entered at Naples the office of the attorney Castagnola, who discountenanced literary work, and kept him severely to the law. He wrote anonymously 'Gli Orti Esperidi' (1722), but the authorship was soon revealed, and Metastasio left the lawyer's office, studied further, and wrote a series of musical dramas, or melodramas in the true sense, which were set by leading composers and given with great success. In 1730 he settled in Vienna as court poet, and there in 1730–40 wrote his best works, 'Demetrio,' 'Issipile,' 'Demofoonte,' 'La Clemenza di Tito,' 'Attilio Regolo.' In the consideration of Metastasio's rank as a poet, his work must be viewed not absolutely, but with regard to its original environment, as done in collaboration with a composer, and rendered by great artists. He wrote, too, for the predominantly vocal system of Italian musical drama; and with this his poetry fell into comparative neglect. His writings have been praised by so good a critic as Symonds for excellent versification, ease of diction, effective simplicity of construction, and frequent imagery of the highest rank. His lyrical verse and crticisms are also of value. The best collected edition of his works is that of 1780–2 (Paris). Consult: Massafia, 'Pietro Metastasio' (1882); also Lee, 'Studies of the 18th Century in Italy' (1880).

Metastasis, (1) in medicine, a change in the seat of a disease, attributed to the translation of morbific matter to a part different from that which it had previously occupied, or to the displacement of the irritation. (2) In botany, a change produced upon a substance designed for the nutriment of a plant, to make its assimilation more easy. Thus, when the starch formed in the leaf of a potato has to be transferred to the tubers as a depot of nutritial material, it is first changed into a soluble substance — glucose.

Metathe'ria, a group-name, not now used, applied to the *Didelphia,* or marsupials, indicating their distinction as a medium subclass between the *Prototheria,* or monotremes, and the *Eutheria,* or higher mammals; but such distinction does not exist in the latter case. See MARSUPIALIA.

Metaurus, mẹ-tā'rŭs, or **Metauro,** mā-tow'-rō, Italy, a river in the Marches. which flows northeast past St. Angelo in Vado, and falls into the Adriatic, southeast of Fano; total course, about 50 miles. It is noted for the victory gained by the Romans under the consuls Claudius Nero and Livius Salinator near its banks over the Carthaginians under Hasdrubal 207 B.C.

Metavoltine. A sulphur-yellow mineral occurring in aggregates of hexagonal scales at Madeni Zakh, Persia. Dichroic. Hardness, 2.5; specific gravity, 2.53; composition: Sulphuric acid, 46.90; sesquioxide of iron, 21.20; protoxide of iron, 2,92; potash, 9.87; soda, 4.65; water, 14.58. Much of the mineral called misy belongs to this species.

Metayer, mĕ-tā'yer, Fr. mā-tā-yā. (L. Latin, *medietarius*), a name given in France to the cultivator of a *metairie* or farm who reserves for himself one portion of the produce as the price of his labor and gives the proprietor the other, which represents the rent of the land after deducting what is necessary to keep up the stock. The greater part of the centre and south of France, and almost the whole of Italy, is cultivated by metayers, who are in general upright, economical, and industrious.

Metella, Caecilia, daughter of Metellus Creticus. Her tomb is the best known of the many that once lined the Appian Way for some miles beyond the walls of Rome, because of the law which forbade burial within the city limits.

Metazo'a, one of the two great sections into which Huxley divides the animal kingdom, the other being the Protozoa. The Metazoa embrace all animals composed of more than a single cell. See ANATOMY, COMPARATIVE.

Metelli, mĕ-tĕl'ī, a Roman family of the *gens Cæcilia.* QUINTUS CÆCILIUS METELLUS MACEDONICUS defeated the Achæans, took Thebes, and invaded Macedonia, etc., and received a triumph 146 B.C. QUINTUS CÆCILIUS METELLUS NUMIDICUS rendered himself illustrious by his successes against Jugurtha, the Numidian king. He took, in this expedition, the celebrated Marius (q.v.) as his lieutenant; was soon recalled to Rome, and accused of extortion and ill-management, but was acquitted of these charges. He celebrated a triumph at Rome 107 B.C. His son, QUINTUS CÆCILIUS METELLUS received the surname of PIUS on account of the love which he displayed for his father when he besought the people to recall him from banishment in 99 B.C. In 83 B.C. he joined Sulla, with whom, three years later, he was united in the consulship. QUINTUS CÆCILIUS METELLUS CRETICUS conquered Crete, and reduced it to a Roman province in 67 B.C. QUINTUS CÆCILIUS METELLUS PIUS SCIPIO, the adopted son of Metellus Pius, in 52 B.C. was colleague in the consulship with Pompey, who had married his daughter Cornelia. Hence he exerted himself to the utmost to destroy the power of Cæsar and strengthen that of his son-in-law. He commanded the centre of Pompey's army at the battle of Pharsalia, and thereafter fleeing to Africa was defeated by Cæsar at Thapsus 46 B.C. He died by his own hand.

Metempsycho'sis. See TRANSMIGRATION.

Meteorites. It is not certain that the distinction commonly made between the smaller meteors, called shooting stars, and meteorites rests upon any essential difference in their physical nature. It has been suggested that while meteorites are solid compact bodies, often of great size and weight, shooting stars may be mere puffs of dust or gas. Both, however, move before encountering the earth with great velocity, in orbits controlled by the gravitation of the sun. The fall of a meteorite is a sporadic occurrence, and no connection has been proved to exist between such falls and the recognized showers of shooting stars, although a small meteorite did fall at Mazapil in Mexico during the display of the Andromedes in 1885. This meteorite, which weighs about ten pounds and is composed of iron alloyed with nickel, is now in the Vienna Museum.

Meteorites are of two classes — the stony meteorites and the iron meteorites. The former are about ten times more numerous than the latter. In the iron meteorites iron usually forms more than 90 per cent of the entire mass, but it is almost invariably alloyed with nickel. In the stony meteorites mineral combinations occur which are peculiar to these bodies, and serve as one of the ear marks by which they may be recognized when they were not seen at the time of their fall.

Other distinguishing marks of meteorites are found in their physical appearance and structure. They are covered with a blackish crust formed by surface melting during their passage through the air. This crust consists mainly of oxide of iron, and is magnetic. Pits and hollows scooped in the surface of a meteorite by the fusing of the less refractory minerals also form a characteristic feature.

When a portion of the surface of an iron meteorite is polished and then etched with acid peculiar markings, called from the name of their discoverer Widmannstatten figures, make their appearance. These are among the most trustworthy criteria of the meteoric origin of suspected masses of native iron.

About one third of the chemical elements known in the laboratory have been found in meteorites. But no new element has ever yet been discovered in them. The following elements occur, in greatly varying quantity, sometimes a mere trace being present:

Iron
Nickel
Cobalt
Copper
Aluminum
Tin
Magnesium
Arsenic
Carbon
Sulphur
Phosphorus
Silicon
Sodium
Calcium
Potassium
Manganese
Oxygen
Hydrogen
Nitrogen
Chlorine
Chromium
Titanium
Lithium
Helium

As the true nature of shooting stars was not understood until after the investigation that followed the great shower of 1833, so the true nature of meteorites was recognized only after a remarkable fall of those bodies which occurred at L'Aigle in France about noon on 26 April 1803. Nine years before, in 1794, Chladni, a German physicist, had formulated the theory that meteorites before encountering the earth traveled in independent orbits in space, but his conclusions were not generally accepted until the occurrence at L'Aigle had focused the attention of men of science. On that occasion between 2,000 and 3,000 meteoric stones were scattered over an area about nine miles long by three miles wide. The French astronomer, J. B. Biot, visited L'Aigle, carefully examined the fallen stones, and collected and discussed the evidence of eye witnesses. Thereafter the old idea that meteors and meteorites were simply atmospheric phenomena was abandoned, and the fact of their extra-terrestrial origin was generally recognized.

Many records of the fall of meteorites have been found in ancient annals, and in modern times, with so many observers continually watching the sky, the number of meteorites seen in flight is annually quite large, although the actual falls observed are always comparatively rare. The number entering the earth's atmosphere in a year has been estimated all the way from 70 up to 3,000 or 4,000. In 1879, on 10 May, there was a shower of meteoric stones in Iowa, the largest mass weighing more than 400 pounds.

Perhaps the most famous meteorite of antiquity was the so-called stone of Egos-Potamos, which fell in Thrace in 466 B.C., and which was described as equaling two millstones in size. Plutarch speaks of it in his life of Lysander. In the Middle Ages the Stone of Eusisheim was very celebrated and became the object of superstitious reverence. It fell at Eusisheim in Alsace on 7 Nov. 1492, when the Emperor Maximilian was at that place. Fragments of this body were taken to Paris and to London, but the principal mass, weighing more than 200 pounds, was suspended in the choir of the church of Eusisheim.

Almost every large meteorological museum contains specimens of meteoric stones and meteoric irons. There are some remarkable examples in the National Museum at Washington. An iron mass, supposed to be of meteoric iron, discovered at Cañon Diablo, Arizona, proved, on examination a few years ago, to contain minute black crystals resembling the diamond, and a meteorite which fell in Russia contained similar black crystals of carbon.

It is yet a disputed question whether the huge masses of iron, weighing many tons, which were brought from Greenland to Stockholm by Baron Nordenskjöld, are really of meteoric origin. The same question attaches to a similar mass which Lieut. Peary transported from Greenland to New York. Other masses of this kind exist in various parts of the world. There is no record of their having fallen from the sky.

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Meteorological Society, The Royal, a scientific body with headquarters in London. Its organization dates from 1850, and in 1866 it was incorporated. All theories and facts pertaining to meteorology are sought for its records, the development of that science in all departments being the object of the association. Besides fellows, the society consists of honorary members, this membership being bestowed upon distinguished persons of other than English nationality. The society publishes the 'Meteorological Record' and the 'Quarterly Journal.'

Meteorology (*τὰ μετέωρα+λόγος*) literally, the science of the things in the air. Meteorology originally included all the phenomena of the air, but many of them are now brought into the realm of astronomy. Meteorology, as the term is understood at the present day, may properly be considered under two heads:— theoretical meteorology and applied meteorology. Theoretical meteorology will be treated in this article as briefly as is compatible with an intelligent understanding of the subject, and special prominence will be given to applied meteorology in its practical aspects in the United States, particularly in its relations to the manifold and all-important interests of commerce and agriculture.

Theoretical meteorology aims to explain all the various atmospheric phenomena by physical laws, and to reduce them to an accurate and scientific basis. It must then include a discussion of the control of temperatures by the sun and their distribution over the globe, together with the different winds resulting from temperature differences; the moisture of the air in its various forms of invisible vapor, cloud, dew, frost, rain, and snow; and finally, an investigation of storms (or cyclones as they may properly be termed), of varying degrees of intensity, that from time to time pass over the land and the sea; their causes and growth, together with their concomitants of destructive winds and heavy precipitation. The study of these phenomena is the province of the meteorologist and physicist, and a successful solution of the problems that they offer is a goal worthy of man's highest ambition and most earnest endeavor.

History.— From remotest antiquity men's minds have been occupied with the ever-varying changes of the weather. The kaleidoscope of the sky, the seasonal changes, and all the elements that affected his comfort and the necessities of his life, arrested the attention of primitive man. Living for the most part in the open air, with imperfect protection from the inclemency of the weather, he was quick to note all appearances that experience had taught him heralded future weather changes. Thus there naturally and insensibly came into existence a mass of weather proverbs that were eagerly remembered and handed down from generation to generation, so that to-day there is no science that is so thoroughly incorporated in the language and folk-lore of the past. The name science is hardly applicable, however, to meteorology as it then existed, as there was no definite knowledge of its phenomena or of the laws that governed them, prognostics being based solely upon the shifting of the wind, the actions of birds and animals, and other local signs of impending changes.

Naturally, there was but little progress made until there were some suitable means of measuring the fluctuations of the different elements. The invention of the thermometer previous to 1597 and the barometer in 1643 marked a new era, and with the use of these instruments careful and continuous observations were begun, and an impetus given to systematic study and research, that has resulted in a fairly good understanding of the subject to-day.

In the United States.— The history of meteorology in the United States may well be divided into two periods: — the first ending with the inauguration of a national weather service under the control of the government, the second extending from that date to the present. In the second period the history of the weather service is virtually the history of meteorological progress, the conditions being such that the work of investigation could, in the main, be carried on more successfully under its control than by individuals or by private enterprise. From the time of the first settlement in America records of temperature and precipitation, of various degrees of accuracy and usefulness, were kept in different parts of the country. The first movement toward bringing any sort of order out of the chaos that reigned was by Benj. Franklin (q.v.), who from correspondence with friends, found that some storms moved in a northeasterly direction over Philadelphia, their force being felt in Boston some 12 hours later. Simultaneous observations in Virginia by Thomas Jefferson and Mr. (afterward Bishop) Madison also showed that some definite law governed the progress of storms, with their accompaniments of precipitation and wind.

In England, Hadley had in 1735 published an article promulgating a theory explanatory of the trade-winds, but unfortunately it was comparatively unnoticed for 50 years. An essay by Dalton, also an Englishman, in 1793, marked an epoch in meteorology, as it was the first instance of an attempt to apply the principles of philosophy to an explanation of the phenomena of the atmosphere. From time to time charts of different kinds were constructed and various views were put forth regarding storms, the consensus of opinion being that they were straight line gales. In 1831 Redfield, in America, published his first essay, which contained the important suggestion that storms were great revolving whirlwinds turning counter clock-wise, with a progressive movement toward the northeast. Later he described the warm southerly winds on the easterly side of storms and the cold northerly winds in the western quadrants, maintaining that these winds neither flowed radially inward to the storm centre nor in circles about it, but spirally inward. In 1841, at about the time that the laws of thermo-dynamics were being formulated, Espy showed that ascending air expands and cools its vapor to the point of saturation, thereby causing rainfall; also that descending air is warmed by compression and clouds are thus dissipated; and that the daily heating of the lower strata of the atmosphere causes convectional currents and the formation of cumulus clouds.

A long controversy ensued as to the respective merits of these two theories of storm formation, it being at the present generally conceded that both causes are effective to a certain extent.

Progress and Development.— A new element was introduced into the discussion by Tracy in 1843, namely, the right hand deflecting component of motion in the northern hemisphere, but his idea also escaped recognition for some years. Coffin and Loomis, with Maury and Henry, added to this physical work statistical results that were of great value. To William Ferrell, mathematician and investigator, is, however, due the honor of first contributing an analytical discussion of the motions of the air and reducing the entire subject to definite mathematical expressions. A careful examination of what had been accomplished in a theoretical way, together with a thorough study of such statistics of storms and their movements as were available, convinced many scientific men that it would be possible to forecast the daily weather changes with a fair degree of accuracy. The invention and use of the electric telegraph more than any other one thing had shown the feasibility of this, for by means of it, it was possible to collect in a few minutes' time the results of synchronous observations at widely separated points. Previous to the outbreak of the Civil War in 1861, Prof. Joseph Henry of the Smithsonian Institution had collected daily observations from some of the principal cities, and indicated the state of the different weather elements on a large map of the United States by means of appropriate symbols. The war interrupted this work, but after the cessation of hostilities there was a strong sentiment in favor of the establishment of a government bureau for the issuing of storm warnings and weather forecasts, representatives of the Smithsonian Institution, the Engineer Corps of the Army, the Navy, the Department of Agriculture, and the American Association for the Advancement of Science being especially active in the agitation that ensued.

The Weather Bureau.— In 1868 Prof. Cleveland Abbe, then director of the Cincinnati Observatory, with the co-operation of the Chamber of Commerce of that city, and the Western Union Telegraph Company, begun issuing a series of bulletins of weather conditions for the benefit of the mariners of the Great Lakes, the first of the kind ever issued in this country. Prof. I. A. Lapham of Milwaukee wished this service extended to include that region also, and in furtherance of his idea sought the assistance of the Chicago Board of Trade and presented a petition to the Chicago Academy of Sciences. One of its members, Hon. H. E. Paine, then a member of Congress, considered the scope of the plan outlined to be too limited, and advised that it be enlarged so as to include the whole country, and then be brought to the attention of Congress. Through his efforts this was done, the result being the passage of a joint resolution 9 Feb. 1870, the provisions of which were:— «That the Secretary of War be, and he hereby is, authorized and required to provide for taking meteorological observations at the military stations in the interior of the continent and at other points in the States and Territories of the United States, and for giving notice on the northern lakes and on the seacoast, by magnetic telegraph and marine signals, of the approach and force of storms.» For this purpose the sum of $20,000 was appropriated. The work of carrying out the provisions of the resolution was entrusted to the signal service of the United States army under Gen. Albert J. Myer, and steps were immediately taken to place the service on a practical working basis. Points at which observations were to be taken were selected, stations equipped, and the members of the corps instructed in the use of the various meteorological instruments, in other duties incidental to the taking and recording of observations, and in carrying on the routine work of the stations.

This was a task beset with many obstacles and difficulties, but Gen. Myer performed it with such remarkable acumen and foresight that to him is due the credit for most of the methods now in vogue in the service, such as synchronous observations, telegraph circuits, weather maps and synopses, and the publication of weekly, monthly and annual reports, the predominant idea throughout being to furnish the public with as reliable information as possible in timely season.

Under the administrations of Gen. Myer and his successors, Gens. W. B. Hazen and A. W. Greely, the work was gradually extended, more and more interests being served until July 1891, when the service was transferred to the Department of Agriculture, thus creating the United States Weather Bureau by an Act that shows the greatly enlarged scope of its duties. «The chief of the weather bureau shall have charge of forecasting the weather; the issue of storm warnings; the display of weather and flood signals for the benefit of agriculture, commerce, and navigation; the gauging and reporting of rivers; the maintenance and operation of seacoast telegraph lines, and the collection and transmission of marine intelligence for the benefit of commerce and navigation; the reporting of temperature and rainfall conditions for the cotton interests; the display of frost and cold wave signals; the distribution of meteorological information in the interest of agriculture and commerce, and the taking of such meteorological observations as may be necessary to establish and record the climatic conditions of the United States, or as are essential for the proper execution of the foregoing duties.» Prof. Mark W. Harrington of the University of Michigan was named by the President as chief of the bureau, serving until July 1895, when he was succeeded by Prof. Willis L. Moore, its present head.

At the central office at Washington the work, for convenience, has been assigned to different divisions under the direct supervision of the chief of the bureau, each having its special line of work. These divisions are described in some detail, as there is thereby given an intelligent understanding, of the duties incumbent upon the bureau. The forecast division receives and charts twice daily telegraphic reports of the prevailing weather conditions throughout the United States, the West Indies, and the southern portions of the British Provinces. Daily forecasts for periods of 24 and 48 hours, based on these charts, are issued for the whole country, together with the weather that trans-Atlantic steamers may expect as far as the Grand Banks. In the case of severe storms when the winds are expected to attain velocities dangerous to marine interests, storm warnings are sent out, not only to the regular stations of the bureau, but also to some 200 special display stations. There are also issued special warnings of cold waves and heavy snows in the winter and of frosts in the spring and fall, especial attention being paid to the needs of truck farmers and the growers of citrus fruits. The province of the River and Flood Service is to obtain information as to precipitation and the amounts of snow and ice on the ground throughout the water-sheds of the principal rivers, whether navigable or not, and the gauging of their various stages. For this purpose, in addition to 48 regular stations, where gauge readings are made, there are 252 special river stations and 74 special rainfall stations. In times of low or average water it gives information as to the future stages of the rivers, thus facilitating commerce, but its chief duty is the issuance of flood warnings in times of threatened danger to life and property. The duties of the Climate and Crop Division have increased from year to year until now the results of its labors are of the greatest benefit to the agricultural interests of the whole country, its bulletins are recognized as an authority, and are eagerly sought for. It maintains a staff of about 3,000 voluntary meteorological observers serving without pay, who render reports of temperature, precipitation, and other miscellaneous meteorological and climatic data, that are published in the Monthly Weather Review and in the monthly bulletins of the State Sections of the Climate and Crop Service. There is thus being collected an immense amount of data that is available for the discussion of climate in its relations to man from either a hygienic or commercial standpoint. During the season of planting, cultivating, and harvesting, weekly reports of weather conditions and their effects upon various crops and farming operations are received from some 15,000 crop correspondents and embodied in both the national Weekly Crop Bulletin and in 42 Section Bulletins. Special bulletins are also issued for the benefit of the corn, wheat, cotton, sugar, rice, and fruit interests. In addition to the duties mentioned above this division has charge of the distribution of all the forecasts and special warnings issued by the Forecast Division. The Instrument Division is charged with the examination, testing, comparison, installation and maintenance of the instrumental equipment of the bureau. The Division of Meteorological Records has charge of the compilation of meteorological and climatic statistics and their application to the varied needs of individuals, corporations, cities, and courts of law. The Section of Barometry and Aërial Exploration conducts an investigation of the problems of reducing observations of barometric pressure, temperature, and vapor-tension to homogeneous bases in their relations to the circulation of the atmosphere, storm development, and forecasting. It also has charge of the exploration of the upper air by means of the theodolite, the nephoscope, balloons and kites. The Monthly Weather Review contains information as to the weather conditions of each month and a statement of their influence upon crop conditions of the different States, together with special articles on the progress of Meteorology and Climatology. There are also the Publications, Telegraph, and Supplies Divisions, the duties of which are indicated by their respeetive titles.

Outside of Washington there are now nearly 200 regular meteorological observation stations manned by some 500 observers, printers and messengers, located at points selected for their favorable situation from a meteorological standpoint, and in the larger cities where the greatest number of commercial and marine interests can be served. Regular observations are now taken twice daily, at 8 A.M. and 8 P.M., 75th meridian time, while in the case of any remarkable disturbance in weather conditions special observations are also taken.

Observations.— An observation, technically so-called, consists of reading the different instruments that record the weather elements, recording, and transmitting the same to Washington and other designated stations. The elements observed are the barometric pressure, current, maximum and minimum temperatures, relative humidity, dew-point, amount of precipitation, if any, state of the weather, with kinds and directions of clouds, direction and velocity of the wind, and any unusual phenomena that may be noted, such as exceptionally high winds, thunderstorms, frost and fog. The instruments consist of standard wet, dry, maximum and minimum thermometers, and the mercurial barometer for measuring temperature and pressure, with wind vane and anemometer for wind direction and velocity. Most stations are also equipped with self-registering instruments that record continuously the fluctuations in pressure and temperature, velocity and direction of the wind, and the number of hours of sunshine. An automatic rain-gauge also registers the times of beginning and ending of precipitation, together with the amounts that occur. The observation having been taken it is embodied in from three to eight words of an ingeniously constructed cipher code and put upon the telegraph circuit. By means of this code five or six words convey the information that would require 10 times that number in ordinary language. It is easily translated and serves the double purpose of eliminating nearly all chances of error in transmission and making a great saving in telegraph tolls. Below is a sample message as sent in the morning:

Boston. *Burnet. Huckberry. Mense. Immense. Curtsy.* Translated the information is as follows: 8 A. M. report; barometer, 30.10 inches; current temperature, 60; precipitation, 0.14 inch; wind, south; weather, cloudy; maximum temperature, 84; velocity of wind, 6 miles per hour; minimum temperature, 54; clouds, "few" cirrus from the northwest.

The telegraph circuits are so arranged that at any station those reports are taken off that are used in chart making and forecasting at that station. These messages take precedence over all others and the system has reached such a degree of perfection that within an hour after the observations are taken they have all been received at Washington and other stations. From this stage all haste is made to translate and chart the reports so that the forecaster will have before him a graphic representation of the conditions that prevail over the whole country, as it is the aim of the bureau to furnish the forecasts and warnings to the public at the earliest possible moment. In addition to the main chart showing the weather conditions at each station, auxiliary charts are also constructed that are of great importance in making the forecasts.

These comprise a pressure-change map, showing 12- and 24-hour changes at each station and departures from the normal; temperature-change map, showing the maximum and minimum temperatures, with changes from the preceding day and from the normal; cloud-map showing the character, amount, and direction of clouds; and a map showing the dry-bulb and wet-bulb temperatures with the differences between the two.

Whereas, forecasts for the whole country were formerly made at Washington, the United States is now divided into seven forecast districts, with centres at Washington, Boston, Chicago, New Orleans, Denver, San Francisco, and Portland, Ore. In charge of each district is a specially-trained official, whose intimate knowledge of meteorology is joined to a long familiarity with practical forecast work, so that with the charts before him he is able to grasp the situation at a glance and as quickly foresee the conditions that are likely to prevail in any section. The successful forecaster must possess those qualifications that would make him preeminent in any other vocation. With a thorough knowledge of meteorology and the topography of the country as a foundation, must be combined the essential attributes of alertness, the power to instantly understand the conditions in their minutest details, and the self-confidence that will enable him to make his forecast without hesitancy and unhampered by any wavering doubts as to its correctness. Experience and long familiarity with the work are also prime essentials, for although six sevenths of our storms move from the Rocky Mountains eastward over fairly well defined tracks, yet their movements are liable to be erratic, and a knowledge of past occurrences under similar conditions is an important factor in determining the phenomena of any particular storm. The forecasts are distributed to the public in a number of ways, that by which the greater number of people is reached probably being the medium of the daily press. The different press associations receive the forecasts as soon as made and immediately furnish them to the papers to whom they render service. They are also telephoned to Chambers of Commerce and other associations where they are posted on bulletin boards. The more important stations of the Bureau are equipped with plants for printing the daily maps and forecast cards, all the typographical and press work being done on the premises. The weather map consists of three parts: (1) a map on which the direction of the wind and the state of the weather for each station are shown by appropriate symbols, while shaded areas show where precipitation has occurred in the past 24 hours. Continuous lines, called isobars, connect points of equal barometric pressure, being drawn for each tenth of an inch, while the dotted lines, or isotherms, drawn for each 10 degrees, connect points of equal temperature. These data are printed on the map by means of the chalk-plate process, so-called; (2) a table showing the current temperature, the change in the past 24 hours, the maximum and minimum temperatures, current wind velocity, and precipitation; the third section comprises the district and local forecasts, a brief synopsis of weather conditions at 8 o'clock, and other miscellaneous data. The forecasts are also printed on franked cards and mailed to post-offices that can be reached the same day, also to business houses, corporations, and other parties, who post them in conspicuous places where the general public has access to them. The forecasts are likewise telegraphed to a large number of distributing centres, from which further distribution is made. This is partly done by means of the telephone, but large numbers of the cards are printed with rubber logotypes and mailed to the surrounding towns. The establishment and extension of the free rural delivery system has brought the forecasts more directly to the rural districts, thus benefiting a class in the community that was not formerly reached. At certain points forecast slips are printed at night and mailed to such free delivery centres as can be reached before the carriers start out on their routes in the morning, so that each family receives a printed forecast for the succeeding 24 hours. As each forecast issued by the Bureau is read by from 1 to 50 persons, it is easily seen that the total number reached is extremely large. This branch of the work, so far as the general public is concerned, is of the utmost importance, although it entails a considerable expense. Results have, however, amply justified its continuance, and the great majority of the people consider that the money annually appropriated for the purpose is well expended.

The practical value of the forecasts depends, of course, on their accuracy, and while there has been a marked improvement in this respect, and the period covered has been greatly extended during the 33 years that the Bureau has been in existence, still it seems as if the limit in both has been nearly reached, in the light of our present knowledge. At the outset, and for several years thereafter, all forecasts were made and issued at Washington, and, being for comparatively large areas, were necessarily brief and couched in general terms. For example, rain would be predicted for a whole State, when it was very probable that only a portion of the territory would experience the foul weather. The tendency of later years has been to localize the forecasts to a greater extent, and thus render better service.

While the forecast officials of the Bureau are competent to make satisfactory forecasts for any section of the country, still it stands to reason that the man who has been stationed at Chicago, for example, for 10 or 15 years, and who, in addition to his manifold qualifications as a successful forecaster and an expert understanding of the mechanics of storms, has an intimate knowledge of local weather peculiarities, will be more competent, and will issue forecasts for that region that will satisfy local demands in the best possible manner. This localizing of forecasts is one of the great problems that confronts the professional forecaster to-day, and the policy of the Bureau is to encourage better work in this direction.

Thus far forecasts have been deduced from a discussion of the meteorological elements as they obtain at the earth's surface, but there are many adherents of the theory that a better understanding of the laws that govern the formation and passage across the country of cyclones and anti-cyclones can be obtained from a systematic investigation of the conditions that prevail in the upper strata of the atmosphere. Spasmodic attempts to acquire a better knowledge of the phenomena of the higher altitudes have been made by means of kites and balloons, but the data gained have been too fragmentary and disconnected to form a satisfactory basis for scientific discussion. Renewed efforts with more modern appliances will doubtless be made in the near future, and it is possible that these studies will assist in solving the problem of making greatly improved forecasts. However, sporadic observations at a few irregularly distributed points will avail little if anything in the work, simultaneous reports from a number of properly located stations sufficient for the construction of daily synoptic charts being required for the purpose.

Ignorance of the conditions that prevail over the ocean off the Pacific and Atlantic coasts is a serious handicap many times to successful predictions. If the experiments in wireless telegraphy now under way result in instruments that will be of practical use, that system can be utilized to great advantage in collecting information. At present no reports are available from west of the Pacific coast, while messages are received regarding West Indian hurricanes, the most destructive storms that visit the Atlantic coast, from the West Indies alone.

Future Possibilities.— It is quite probable that in the future there will be anchored stations along both coasts, from which meteorological observations at sea will be received by wireless telegraphy. Although the storm warnings now sent out in advance of hurricanes are of inestimable benefit, the advantages accruing from them would be greatly enhanced by such an establishment. The question of seasonal forecasts is also of great moment and is daily brought home to the forecaster, as he is often questioned as to what the coming season may be, whether wet or dry, hot or cold. So far it has been impossible to give any answer based on facts and reason, but the more optimistic of meteorologists are hopeful that ultimately the weather of a season may be foretold with as great a degree of accuracy as that of the coming 24 hours. With wireless telegraphy sufficiently perfected to adapt it to daily use in the transmission of weather messages, a synoptic weather chart embracing the inhabitable globe would be feasible, and the use of it, combined with a knowledge gained from upper air observations, may be the means of enabling the forecaster to overcome the obstacles to long-range forecasts, that is, forecasts for a week, a month, or a season.

Again, as all mundane conditions of heat and cold, life and growth, are attributable to the influence of the sun, it may be possible that a careful consideration of the varying phenomena of that body may show that climatic fluctuations on the earth are directly dependent upon certain changes there. Imbued with this idea, scientists are turning their attention to the recurrence and frequency of sun-spots and solar prominences, hoping by a comparison of data to trace some definite connection between those disturbances of the sun's photosphere and the ever-varying seasons of the earth. The theory has a certain degree of plausibility, and in view of the many remarkable scientific discoveries of the last generation, it is not impossible that the next may find that it is based on facts. Then the mariner can regulate his times of sailing with a certain knowledge of the weather that he may expect to experience during his voyage. Then agriculture will be reduced to a scientific and absolute basis. Droughts and floods may occur, but, forewarned, the husbandman will take every advantage of favorable periods and be prepared to minimize the deleterious effects of adverse conditions. The solution of many questions in astronomy relative to the solar system entailed a vast amount of work distributed over many years, and when it is remembered that meteorology is as yet in its infancy, the world may well feel proud of the degree of success that has so far been attained, in the limited time that the science has been under investigation. Encouraged by the past, it can look hopefully forward to a future even more fruitful of blessings to mankind. JOHN W. SMITH,

Forecast Official, U. S. Weather Bureau.

Meteors, or **Shooting Stars,** are those bodies that enter the earth's atmosphere from without and, being intensely heated by impact with the air, are generally consumed before reaching the ground. Meteors vary greatly in size, but the vast majority probably do not exceed a single grain in weight. A few may be seen on any clear night, and the number entering the atmosphere every 24 hours has been estimated by Professor Newton at not less than 15,000,000. The appearance of meteors is graphically described by the phrase "shooting stars." Most of them are no brighter than ordinary stars, but some rival the brightest planets in luminosity. They seem to leave shining trails behind them, due in the case of small meteors probably to persistence of vision. But the larger ones, resembling brilliant fireballs, leave trails which sometimes remain visible for many minutes. Occasionally large meteors are seen to separate into a number of pieces, or even to burst asunder like exploding shells with loud detonations audible many miles away. Some of the more massive meteoric bodies reach the earth's surface. These are called meteorites and will be found described under a separate heading.

Meteors before encountering the earth are invisible to us, traveling in their own orbits about the sun. The moment they strike the atmosphere their kinetic energy begins to be transformed into heat, and they become visible at an elevation of from 75 to 100 miles, where the air is more rarefied than under the exhausted receiver of an air-pump. This rarefaction of the upper air does not, however, save them from the effects of their impact with the atmospheric molecules. Sir William Thomson (Lord Kelvin) has shown that the effect of the friction of the air upon a meteor is the same as if the latter was enveloped in a blowpipe flame having a temperature of many thousands of degrees, and the degree of temperature thus developed does not depend upon the density of the medium, but is as great in rare as in dense air. In these circumstances the small meteors may be consumed in the fraction of a second. Even if meteors, instead of moving independently about the sun, stood fast in space to be encountered by the earth in its annual flight round the sun, their fate would be similar, for the velocity of the earth in its orbit is more than 19 miles per second, and Professor Newcomb has pointed out that the rise of temperature produced by the impact of our atmosphere with a meteoroid at rest would be nearly 600,000 degrees! But before such a degree of temperature is actually attained the meteor, even though composed of the most solid metal, must be burned up or volatilized with an immense evolution of light and heat. This accounts for the visibility, at the height of 50 to 100 miles, of meteors whose mass may not exceed a single grain.

The height of a bright meteor may be ascertained by comparing observations of its apparent track among the stars made simultaneously from two points on the earth's surface, a number of miles apart. Each observer sees the meteor projected in a different direction, and the fixity of the star-marked background of the sky across which it moves affords the means of determining the angle between the lines of sight of the two observers. This gives the parallax of the meteor, and, the length of the base line between the observers being known, the meteor's distance and elevation can thence be calculated. It is probable that most meteors are entirely consumed by the time they have descended to within 40 or 50 miles of the earth's surface, but some may arrive within five or ten miles of the surface before being dissipated in dust and gas. This statement, of course, takes no account of the massive meteors, or meteorites, which survive the fiery passage and strike the ground.

In addition to the sporadic shooting stars which may be seen on any dark night, darting in various directions across the heavens, these bodies occasionally appear in showers, when the sky seems to be filled with flying sparks of fire all radiating from some fixed point among the constellations. These showers are caused by the earth encountering shoals of meteors traveling in elliptical orbits about the sun.

Scientific study of the orbits of shooting stars began after the occurrence of the most brilliant meteoric shower on record, that of 13 Nov. 1833. This spectacle, which excited the greatest interest among all beholders, and was looked upon with consternation by the ignorant, many of whom thought that the end of the world had come, was witnessed generally throughout North America, which happened to be the part of the earth then facing the meteoric storm. Hundreds of thousands of shooting stars fell in the course of two or three hours. Some observers compared their number to the flakes of a snowstorm, or to the raindrops in a shower. The more observant spectators noticed that all the meteors appeared to radiate from a fixed point in the constellation Leo. Tracing their trails backward it was seen that they came together at that point, like the ribs of an opened umbrella meeting about its central stick. This peculiarity is now known to characterize all meteoric showers, although when the number of meteors is not very great the ribbed appearance produced by the convergence of their trails around the starting point is not so conspicuous. The common centre from which the meteors appear to radiate is called the radiant point, and the determination of its exact location among the stars is of the first importance in ascertaining the actual path of the meteors in space outside the earth. A considerable number of such radiant points are now known, each different swarm of meteors whose orbit happens to intersect the orbit of the earth having its own radiant, the position of which depends upon the situation of the meteoric orbit with reference to the earth.

The explanation of the radiant point depends simply on the laws of perspective. The meteors are traveling in parallel paths in a broad cylindrical column, which may envelop the whole earth. When they become visible by striking the air, the observer, looking in the direction from which they approach, sees those that are coming straight toward him as bright points, which grow rapidly larger and then suddenly disappear when they are consumed. Others which, if they reached the earth, would strike to the right or left, or in front of or behind him, appear to diverge in all directions. The same effect is visible when snowflakes are falling vertically on a calm day. Looking straight upward in the midst of the shower of flakes the observer sees them apparently diverging toward every point of the compass, with the exception of the few that fall straight into his eyes.

Immediately after the great display of 1833 Professor Denison Olmsted of Yale College announced that what had occurred was an encounter by the earth with a vast swarm of meteors moving round the sun. The probability that such an encounter was a recurrent phenomenon suggested itself. It was also observed that there were other, less brilliant, showers at different times of the year, notably the annual display on 10 August, having its radiant point in the constellation Perseus. George Adolf Erman, a German physicist and mathematician, about 1839 clearly showed how the orbits of the meteoric swarms causing such showers could be determined, but it was not until Prof. Hubert A. Newton of Yale College took up the inquiry in 1864 that the final solution of the problem was begun. Prof. Newton, by a careful discussion of ancient records, demonstrated that ever since the 10th century of our era there had been recurrent showers of meteors in the autumn at an average interval of 33¼ years. Sometimes the interval was 34 years and sometimes only 32 years, or less, but the mean was 33¼. Upon this basis a return of the shower was predicted for 1866 or 1867.

There had been a gradual change in the date of the showers, which, beginning with 13 October in the year 902, had become 13 November in 1833, but this could be accounted for by planetary attractions shifting the position of the meteors' orbit so that its point of intersection with the orbit of the earth moved forward along the latter about a degree and a half in a century.

It had also been observed that usually there was a considerable display of the meteors a year before or a year after the principal shower. The evident explanation of this was that, instead of being concentrated at one point on their orbit, the meteors were strung along in a column of sufficient length to occupy at least two years in crossing the point of intersection with the path of the earth, so that the latter after meeting them once, could complete its annual circuit and arrive again at the crossing place before the whole column of meteors had passed.

The question remained, what was the length of the orbit of the meteors, or how long a time did they require to make a single journey round the sun and return to their meeting place with the earth? Prof. Newton's computations showed that there were five different orbits, any one of which would be consistent with the observed facts. The test by which the real orbit could be selected from the five possible orbits depended on the perturbing action of the planets, already referred to, and the application of this test would require long and laborious mathematical work.

Before this work had been done the predicted return of the meteors occurred, with a notable shower in November 1866, followed by a second display the next year. On neither occasion was the spectacle equal to that of 1833. Prof. John Couch Adams of Cambridge University, England, now took up the work of computing the planetary perturbations, and he showed that the period of 33¼ years must be the true one because it alone satisfied all the conditions of the problem. This period, it will be seen, corresponds exactly with the mean interval between the showers. The orbit is a long ellipse, its inner end being a little nearer the sun than the earth is, its outer end beyond the orbit of Uranus.

The period and orbit of the November meteors having thus been determined, their next return, in 1899 or 1900, was eagerly awaited. Before the time arrived, however, astronomers had begun to foresee the probability of a disappointment. Dr. Johnstone Starey and Mr. A. M. Downing had calculated the perturbative effect of Jupiter and Saturn upon the swarm, the action of these planets having been particularly effective after 1867, and had pointed out that the result must have been a swerving inward of the meteoric orbit, so that it could no longer intersect the earth's orbit at the old meeting point. The event justified these calculations, for although a considerable number of the meteors were seen in 1899 and 1900, there was no such display as would have occurred had the earth plunged through the main meteoric column.

The orbit of the August meteors or Perseids was also calculated, and this was found to be a still larger ellipse, extending at its most distant point far beyond the orbit of Neptune. In the case of the August meteors the showers occur annually, every time the earth crosses the meteoric orbit. This is due, as Erman showed, to the meteors having become spread entirely around their orbit in a closed ring, so that they are continually passing the point of intersection with the orbit of the earth. A few of the November meteors are seen nearly every year, showing that some of them also have been scattered along the entire circuit of the orbit, although the greater number, in this case, are still collected in a swarm, confined to a relatively small part, one tenth or one fifteenth, of the entire length of the orbit.

The next step was the discovery of an intimate relationship between meteors and comets. In 1867 Giovanni Schioparelli of Milan showed that the August meteors travel in the same path as that of a bright comet known as Tuttle's, which was discovered in 1862. Shortly after this announcement, and while it was still under discussion, Leverrier published a revised orbit of the November, or Leonid, meteors and almost simultaneously Oppolzer published an orbit of Tempel's comet, which had appeared in 1866. Examination showed that these two orbits were practically identical, thus seconding Schioparelli's conclusion with regard to the August meteors by furnishing proof that the November meteors also traveled in a comet's track. In 1872 there came a third discovery of the same nature. A comet known as Biela's, which had split in two in 1846, failed to return when due in 1872, but on the night of 27 November of that year, when the earth was passing close to the orbit of the missing comet, a new and brilliant shower of meteors, with its radiant point in Andromeda, made its appearance. These meteors were seen again in 1885 and 1892. Their orbit coincides with that of the lost comet of Biela. The interval between their displays is seven years, but owing to planetary perturbation the date of their appearance in 1892 had fallen back from 27 November to 23 November. They were not seen in 1899.

About a hundred meteoric swarms have now been recognized, most of them furnishing very inconspicuous displays, and at least half a dozen of these have been shown to travel in the paths of comets. In the table at the bottom of this page are given the elements of the orbits of the three greatest meteoric swarms known to be connected with comets, compared with the elements of the orbits of the comets concerned:

Following is a list of the principal meteor showers with the positions of their radiant points and the dates of their maximum displays. The names are derived from the constellations in which the radiants are situated:

PRINCIPAL METEOR SHOWERS.

NAME	Radiant		Maximum
	Right Ascension	Declension	
Quadrantids	15 H., 19 M.	N. 53°	Jan. 2
Lyrids	17 59	N. 33°	April 20
Eta Aquarids ...	22 30	S. 2°	May 2
Delta Aquarids	22 38	S. 11°	July 28
Perseids	3 4	N. 57°	Aug. 10
Orionids	6 8	N. 15°	Oct. 19
Leonids	10 0	N. 23°	Nov. 15
Andromedes	1 41	N. 43°	Nov. 23
Seminids	7 12	N. 33°	Dec. 7

These showers occur annually and some of them continue for several nights in succession, the position of the radiant slowly shifting in the meantime with the change in the direction of the earth's motion in its orbit. The Perseids last for no less than five weeks.

Some have supposed that all the known meteoric swarms are composed of the scattered debris of comets which have been broken up by the tide-producing action of the sun, but this is not yet certain. The amount of disintegration suffered by a comet depends upon the number of its trips round the sun, so that the longer it has revolved in an orbit having a short perihelion distance the more widely its particles may be scattered along its track. Since the Leonids still form a somewhat compact swarm, while the Perseids are scattered in a complete ring, it has been assumed that the former are later comers in the solar system (or at least later comers into the near neighborhood of the sun) than the Perseids, and Leverrier tried to fix the date of their first appearance by showing that Tempel's comet, with which the Leonids are related, must have suffered perturbations from a near approach to the planet Uranus in the year 126 A.D., which may have changed its orbit from a very large ellipse, having a perihelion point almost as distant as the orbit of Jupiter, to a smaller ellipse corresponding with the present path pursued by the comet and the November meteors.

GARRETT P. SERVISS,
Author of 'Other Worlds.'

ELEMENTS OF ORBITS OF THREE GREATEST METEORIC SWARMS.

ELEMENTS	Perseids	Tuttle's Comet	Leonids	Tempel's Comet	Andromedes	Biela's Comet
Longitude of node...	138° 16′	137° 27′	231° 28′	231° 26′	246° 0′	246° 0′
Inclination of orbit..	64° 3′	66° 20′	17° 44′	17° 18′	12° 0′	12° 33′
Longitude of perihelion	343° 38′	344° 41′	56° 25′	60° 28′	110° 7′	109° 25′
Perihelion distance...	0.9643	0.9626	0.9873	0.9765	0.8472	0.8606
Direction of motion..	retrograde	retrograde	retrograde	retrograde	direct	direct

Meth. See Mead.

Methane, Marsh Gas, or **Fire-damp,** a colorless, odorless, combustible gas, having the chemical formula CH_4. The name “methane” is derived from the fact that this gas is closely related to “methyl alcohol,” the word “methyl” being itself derived from two Greek words which signify “wood spirit.” The name “marsh gas” is given in allusion to the fact that methane is formed, in nature, by the decomposition of dead leaves and other vegetable matter, in wet, marshy places. Miners call the gas “fire-damp,” from the fact that it occurs in coal mines, where it sometimes forms explosive mixtures with the air, detonating violently when ignited by contact with the naked flame of a lamp. The expression “fire-damp” does not imply the presence of moisture, “damp” being here used in the sense of “vapor.” (Compare the German word “Dampf.”) To prevent the disastrous explosions of fire-damp in mines, Sir Humphry Davy invented a form of lamp in which the flame is surrounded by a cylinder of wire gauze, the gauze permitting the access of air to the flame, while preventing the passage of flame from the interior of the lamp to the air of the mine. (This action of wire gauze will be readily understood by bringing a piece of such gauze down upon the flame of a candle, and noting that the candle flame does not pass up through it.) The Davy safety lamp is now used only in mines in which the evolution of methane is unusually abundant, free ventilation by means of blowers or fans being quite sufficient to prevent explosions in most cases, especially in the mines of the United States. Methane is formed in large quantities during the destructive distillation of wood (see Alcohol), and it also constitutes more than a third of the bulk of illuminating gas, as prepared by the distillation of coal. Pure methane is most conveniently generated by heating sodium acetate ($NaC_2H_3O_2$) with caustic soda ($NaOH$), methane and sodium carbonate being formed, as indicated by the equation $NaC_2H_3O_2 + NaOH = Na_2CO_3 + CH_4$. It may also be prepared by passing a mixture of carbon dioxid and the vapor of carbon disulphid over red-hot metallic copper; this reaction being of interest to the chemist, because it illustrates the formation of a hydrocarbon from substances which are admittedly inorganic in nature. Methane is the lightest known gas, with the exception of hydrogen and helium. Its specific gravity, as compared with air at the same temperature and pressure, is about 0.553. It has been liquefied by simultaneous exposure to great cold and to high pressure. When compressed under a pressure of 30 atmospheres, in the presence of water and at a temperature below 32° F., it forms a crystalline hydrate, which decomposes again into water and methane when the temperature is raised and the pressure removed. Methane is of the greatest importance in theoretical chemistry, since the entire series of fatty compounds (see Fatty Compounds) may be considered to be derived from it by replacing its hydrogen atoms by atoms of other kinds, or by organic radicals. Indeed, Kekulé regarded all organic compounds as derivatives of methane. Methane burns with a bluish-yellow flame, which is almost non-luminous. It was formerly called “light carburetted hydrogen,” in distinction from ethylene, which was known as “heavy carburetted hydrogen,” or as “bicarburetted hydrogen.” Methane is classed as a paraffin, being the simplest member of the paraffin group.

Methodist Book Concern. See Methodist Episcopal Church.

Methodist Church (South). The Methodist Episcopal Church (South) became a distinct ecclesiastical organization in 1845. For a period of 60 years, extending from 1784, when the Methodist Episcopal Church was formed, to 1844, when it was divided, the church in the Northern States, and in the Southern States constituted one body. At the organization of the Methodist Episcopal Church, there were 14,988 members; 84 itinerant preachers, besides several hundred local preachers and exhorters, with more than 60 church buildings. Nearly nine tenths of all the members in 1784 were in the Southern States. According to the minutes for 1812 there were 195,357 members and of these 128,299 were south of Mason and Dixon's line (q.v.). John Wesley, the founder of Methodism, declared that the second Methodist society ever organized in the world was formed in Savannah, Ga. The only part of American soil John Wesley ever set foot upon is located in the South. He landed on a small island near Savannah, Ga., Friday, 6 Feb. 1736 and sailed back to England on Thursday, 22 Dec. 1738. During the two years he spent in Georgia he learned through a hard experience the lessons which were afterward embodied in the doctrines of Methodism. The very beginning of Methodism, therefore, was in the South, for the second Society ever organized in the world was formed there and this Society, through the influence of the Moravians, was more distinctly characteristic of such as afterward made up the body of early Methodism than the first, which was formed in Oxford, England.

It is contended by many good authorities that the first Methodist Church ever organized in America, was also formed in the South, in Baltimore, Md. This, however, is disputed by other good authorities who contend that the first Methodist Church in America was organized in New York city. Nine tenths of all the members at the time of the formation of the church into an ecclesiastical body in 1784, were in the South. The term South might therefore be used to define, in a geographical sense, almost the whole of Episcopal Methodism in the beginning of its history. In the South, the movement mainly had its origin, and here it received its setting. Here it has flourished and received into its membership the first settlers, the old families, and here it had maintained its original type, both of life and ecclesiastical organization. It is well known that the question of slavery had something to do with what Rev. Dr. J. M. Buckley, in his ‘History of Methodism,’ happily terms the “bisection of the Methodist Episcopal Church” in 1844. The real cause, however, of the separation of the Methodist Episcopal Church into two ecclesiastical bodies, was not slavery, but the difference of opinion between the northern and southern sections of the church as to the attitude the church should take toward slavery, as a civil institution. Opposition to the institution of a slavery, at the time the Church was formed, came almost wholly from the Southern States. On the Conference Minutes for 1784 question 12 reads as follows: «What shall we do with our friends that will buy and sell slaves?» Answer, «If they will buy with no other design than to hold them as slaves and have been previously warned, they should be expelled: and permitted to sell on no consideration.» Question 13 is as follows: «What shall we do with our local preachers, who will not emancipate their slaves in the States where the laws admit it?» Answer, «Try those in Virginia another year, and suspend the preachers in Maryland, Delaware, Pennsylvania and New Jersey.» Such were the views of Methodist preachers in Conference when nine tenths of them were in the Southern States. The convictions of nine out of every ten of the preachers were shared by the constituted authorities of the Southern States. In 1783, just the year before the organization of the Methodist Episcopal Church, the State of Virginia ceded to the United States all that region then known as the Northwest Territory which was owned by the Original Charter of Virginia, and out of which had been carved the States of Ohio, Indiana, Illinois, and parts of Michigan and Minnesota. This cession was made with the distinct understanding between Virginia and the United States that in the States to be created out of the territory, slavery was not to be allowed. That act had greater influence in bringing about the ultimate abolition of slavery in this country than any act of any other State. As late as in 1789 the State of Georgia passed a law prohibiting the importation of African slaves into that State. At this period of our country's history, the sentiment in favor of slavery was perhaps stronger in the North than in the South. At that time vast sums of money were represented by the shipping industry engaged in bringing slaves to this country, and those ships sailed mainly from New England ports. After the cession of the Northwest Territory by Virginia to the United States, Congress passed an Act creating the Territory of Indiana, and in the act prohibited the introduction of slaves to that Territory. On December 1802, a convention of the people of Indiana Territory was held at Vincennes and there prepared a petition which they adopted and sent to Congress, praying that the Act prohibiting slavery in the Territory be annulled and allowing slaves to be introduced. That convention was presided over by General William Henry Harrison, who signed the petition as President of the Convention and presented it to Congress, in February 1803. In Congress, the petition was referred to a committee, which recognizing the conditions of the contract made with Virginia, reported on it unfavorably, and there the matter ended. When the Constitution of the United States was adopted in 1787, it was provided in Section 9, Article I., that the African slave trade should not be abolished before 1808. That clause in the Constitution delaying the abolition of the traffic in slaves for eleven years, was understood and declared in the South to have been inserted in the interest of the New England ship owners who were engaged in the traffic. It was the custom of the preachers in the Southern States, irrespective of their personal views on the moral phases of the institution of slavery, to follow the advice given by Richard Watson, when speaking to the Wesleyan Methodist preachers in the West Indies in 1833; he said, «Your only business is to promote the moral and religious improvement of the slaves to whom you may have access, without in the least degree in public or in private interfering with their civil condition.»

The convictions of the Southern members were voiced by the General Conference held in 1840 in the following language: «While the Church has encouraged emancipation in those States where the laws permit it, and allowed the freedmen to enjoy freedom, we have refrained, for conscience sake from all intermeddling with the subject in those other States where the laws make it criminal. And such a course we think agreeable to the Scriptures, and indicated by Saint Paul in his First Epistle to the Corinthians, Chapter vii., verses 20-24. And, in their address declared that «at no period of the church had the mere owning of slaves subjected the Master to ecclesiastical excommunication.» But, as the time of the General Conference of 1844 drew near, it became clear to the members living in the South, that the traditional refusal of the Church to interfere with existing political and civil relations was becoming a thing of the past. Bishop James O. Andrew had, by marriage and otherwise, become directly connected with slavery. A resolution signed by J. M. Trimble and J. B. Finley, members from Ohio, was introduced and adopted by a large majority, which read as follows:

> Whereas the discipline of our Church forbids doing anything calculated to destroy our itinerant general superintendency, and whereas Bishop Andrew has become connected with slavery by marriage and otherwise, and this Act, having drawn after it consequences which in the estimate of the General Conference will greatly embarrass the exercise of his office as an itinerant General Superintendent if not in some places entirely prevent it. Therefore,
>
> Be it resolved, that it is the sense of this General Conference that he desist from the exercise of this office so long as this impediment remains.

The vote on this resolution plainly showed that radical difference on the fundamental theories of Church and of law existed between Northern and Southern members. And it may be truthfully said that the same differences have continued to mark these two bodies since their separation. After the adoption of the resolution, 51 delegates from the Southern States protested against this action of a majority of the General Conference. In their esteem, such a decision placed in jeopardy the General Superintendency of the Church by subjecting any bishop at any time to the will and caprice of a majority of the General Conference not only without law but in defiance to the restraints and provisions of law. A committee of nine was appointed to devise a scheme for the mutual and friendly division of the Church. The report of this Committee is known in history as «The Plan of Separation.» According to its provision an emergency was to be met without schism. The Church was to be divided in Christian kindness and the strictest equity, for mutual convenience and prosperity. The part of the Church located in the South was to separate from the part of the Church located in the North, in no sense that the part of the Church located in the North did not separate from the part located in the South. Robert Paine was the chairman of the committee which prepared the plan of separation, and its various provisions were adopted by an almost unanimous vote. On 8 June 1844, the last General Conference of the United Church came to a close. The delegates from the Southern States before leaving New York, the seat of the General Conference of 1844, decided to propose the holding of a convention in Louisville, Ky., of delegates from the Southern Conferences.

The convention met in Louisville in May 1845, and there declared that the Southern Conferences represented a distinct connection, under the name of «the Methodist Episcopal Church South.» Provision was made for holding the first General Conference of the new organization in Petersburg, Va., in May 1846. At the time of the division in 1844, there were 450,000 members in the Southern Church. In 1860 there were 757,205 members, of whom 207,766 were colored. These figures were reduced after the Civil War, many of the colored people having joined other bodies of colored Methodists. In 1870 the Colored Methodist Episcopal Church in America was established, and nearly all the colored people remaining in the Methodist Episcopal Church (South) up to that time, united with the new organization, so that in 1872 there were in the Methodist Episcopal Church (South) 654,159 members of whom there were only 3,232 colored persons.

The Methodist Episcopal Church (South) has increased rapidly in membership since 1872. According to the general minutes of the Church the statistics of this body were as follows: total number of members and preachers, 1,535,032; traveling preachers, 6,469; local preachers, 4,816; infants baptized, 28,472; adults baptized, 55,848; Epworth Leagues, 5,346; Epworth League members, 116,579; Sunday Schools, 14,423; Sunday School teachers, 104,650; Sunday School scholars, 934,110; church buildings, 14,872; value, $25,203,303; parsonages, 4,092; value, $4,790,188; annual conferences, 47; amount paid for missions foreign and domestic, $477,394; schools and colleges, 132; value endowment, $2,757,197; value of property, $5,877,000.

REV. JAMES W. LEE,
Saint John's Church, Saint Louis, Mo.

Methodist Episcopal Church, The. It is not a paradox to say that American Methodism originated in England; for John Wesley, a clergyman of the Church of England and an alumnus of Oxford University, is acknowledged to be the founder of that form of Methodism which was permanently established on this continent. His doctrines were those of the Church of England, but a new experience, attained 24 May 1738, caused him ever afterward to place special emphasis on certain of them. In the latter part of 1739 he organized «The United Society» consisting of those like-minded with himself. From this dates Wesleyan Methodism, of which American Methodism is directly descended. Twenty-eight years afterward there were in Great Britain and Ireland about 26,000 members enrolled.

So far as is certainly known not a single Wesleyan Methodist appeared in the territory now included in the United States of America until 10 Aug. 1760, when a company of emigrants from Ireland arrived in New York. Among them were several followers of John Wesley; one of these, Philip Embury, had served as a Wesleyan local preacher. Five years later another vessel brought over five families, most of whom were related to Embury; these also settled in New York. Nothing is known of them as Methodists till the latter part of 1766, when Mrs. Barbara Heck manifested genuine zeal by arousing in Embury, her cousin, the conviction that they were in danger of falling away, and inducing him without an hour's delay to open preaching services in his own house. There and then to a congregation of five he preached the first Methodist sermon in America. In 1767 the society was reinforced by Captain Thomas Webb, of the British Army, who had been authorized by Wesley to preach. His oratorical powers, zeal, rank and private means, made him a most valuable accession. With his aid Wesley Chapel (John Street, N. Y.), the first Methodist church in America, was completed, and was formally opened 30 Oct. 1768.

Meanwhile a work of which the Methodists of New York knew nothing was progressing in Maryland. Robert Strawbridge, with several other Irish immigrants, had settled in Frederick County. He preached the first sermon, formed the first society, and built the first preaching house for Methodism in Maryland. His society soon contributed four preachers to the general movement. By some writers it is stoutly maintained that Strawbridge began to preach and had built his meeting-house before Embury preached his first sermon. Testimony is adduced on both sides of the question of priority, but the standard historians of Methodism are almost a unit in the conclusion that while there was little difference in time, Embury's claim as the first Methodist preacher is established beyond reasonable doubt.

In the 26th English annual conference, sitting at Leeds in August 1769, Wesley said, «We have a pressing call from our brethren in New York, who have built a preaching house, to come over and help them.» Joseph Pilmoor and Richard Boardman were commissioned to America, and a subscription taken on the spot furnished £50 to assist in paying the debt on the preaching house in New York, and £20 for their passage. In 1771 the number of members reported to Wesley's Conference for the «great Continent of North America» was 316. Wesley asked for volunteers to send to the United States; five responded, but two only, Francis Asbury and Richard Wright, could be spared. The former on arriving immediately manifested great zeal and fidelity in the administration of discipline, and the year after his arrival he received a communication from Wesley placing him in charge of all the preachers, including Boardman and Pilmoor. In 1773 Wesley sent over Thomas Rankin, one of the chief men of the Wesleyan movement, a Scotchman, a man of iron will and inexorable conscience. He brought a commission as superintendent of the American societies, superseding Asbury, who was younger and of much less experience.

The first American Conference was held in the city of Philadelphia, beginning on 14 July 1773, and continuing in session three days. It opened with nine preachers, and on the second day Francis Asbury arrived. Every preacher was a native of Europe. One thousand and sixty members were reported. The Conference unanimously adopted the foundation principles of American Methodism. The authority of Mr. Wesley and the British Conference was to extend to the preachers and people in America, as well as in Great Britain and Ireland; and the Doctrine and Discipline of the Methodists as contained in the English Minutes, to be the sole rule of their conduct and the standard of their preaching. The Conference resolved that if any preachers should deviate from the Minutes it could have no fellowship with them until they changed their conduct. It unanimously agreed that every one who acted in connection with Mr. Wesley, in America, was "strictly to avoid administering the ordinances of baptism and the Lord's Supper." Those "among whom they labored were to be earnestly exhorted to attend church and to receive the ordinances there." Similar conferences have been held annually, and the institution is an integral part of the constitutional principles and machinery of the church.

The Conference of 1776 assembled in Baltimore on the 21st of May under great tribulation. The membership had increased 50 per cent during the year, but Asbury was ill and unable to attend, and the country was full of wars and rumors of wars. The Conference appointed 26 July as a day of fasting and prayer. Before that time arrived the Declaration of Independence, which affected profoundly every law and interest of the colonies, and was destined to influence Methodism to an extent not yet fully measured, had been submitted to the judgment and sympathy of the world. Notwithstanding the agitation of the public mind, the Methodists devoted their energies chiefly to increase and consolidation; so that the returns to the Conference of 1777 showed large gains in membership and preaching staff. The English preachers, perceiving that the war would last for an indefinite period, determined to return to their own country, and within a few months all of them did so except Francis Asbury; and on account of the unpopularity of the English preachers he was forced into retirement.

Controversies arose because the people were without the sacraments. They were generally destitute of the Lord's Supper and there was no one to baptize the children. Most of the clergy of the Church of England had left the country, and a large proportion of the few that remained were indifferent to the needs of their parishes or hostile to the Methodists. In the emergency a large conference, consisting principally of Southern members, appointed a committee to ordain themselves; this being done, they set apart other ministers for the same purpose that they might administer the ordinances to those whom they had taught the way of salvation. Most of the preachers and members in the South sympathized with them; but those north of Virginia were opposed to the action. When disruption seemed inevitable, a compromise was reached and the administration of the ordinances was suspended pending direction from Wesley, who advised them to endure deprivation till the path of duty became too plain to be mistaken.

Correspondence with England having ceased or become uncertain, and General Assistant Rankin having left the country, the conference unanimously chose Francis Asbury to "act according to Wesley's original appointment and preside over the American Conference and the whole work." At the close of the war the entire country began to call for Methodist preachers. At the Conference early in 1784 the wide distribution of the work was recognized, and an increase of 1,248 members shown. Wesley having slowly reached the conclusion that to save the societies in America from disintegration they should be organized under an Episcopal form of government, proposed to Thomas Coke, an alumnus of Oxford, a Doctor of Laws and a presbyter of the Church of England, a man of considerable fortune, who had allied himself with him and his work about four years previously, to accept ordination as a superintendent and to proceed in that character to the United States.

After considering the matter for about two months Dr. Coke acceded to the proposal, and at Bristol, England, assisted by Coke and the Rev. James Creighton, a minister of the Church of England, Wesley ordained Richard Whatcoat and Thomas Vasey presbyters for America. After this was done Wesley ordained Coke a superintendent, giving him a certificate of which the original, in Wesley's hand-writing, is extant. He also prepared a letter explaining the grounds of this action, to be circulated among the societies on Coke's arrival in America. The grounds he assigned were that "the English government had now no authority over them, either civil or ecclesiastical"; that he was convinced "many years ago that bishops and presbyters are of the same order and consequently have the same right to ordain"; that "for many years he had been importuned to exercise this right, but he had refused for peace sake, and also because he was determined as little as possible to violate the established order of the national church to which he belonged." He had vainly tried "to induce the bishop of London to ordain one." "There were no bishops in North America that had a legal jurisdiction; for hundreds of miles together there were none either to baptize or administer the Lord's Supper"; therefore he had "appointed Thomas Coke and Francis Asbury to be joint superintendents in North America." Until he was 42 years old Wesley believed in Diocesan Episcopacy as a distinct order, in direct succession from the Apostles. He attributed the radical change in his views to his reading Lord King's 'Account of the Primitive Church' and Stillingfleet's 'Irenicon.' The former he read 20 Jan. 1746, records the fact in his journal for that date, and says, "In spite of the vehement prejudice of my education I was ready to believe that this was a fair and impartial draught; if so, it would follow that bishops and presbyters are (essentially) of one order." This entry was made 38 years before Wesley "laid hands" on Coke.

Coke and the two elders were enthusiastically received in the United States; a special conference of the preachers was called which, at a meeting begun on Friday, 24 Dec. 1784 (known as the Christmas Conference), established and named the Methodist Episcopal Church, recognized the right and competency of Coke to confer orders, and unanimously elected him and Francis Asbury to be joint superintendents. The powers of bishops, presbyters and elders were specified and certain rules formed. The doctrines of the church were settled as comprehended in certain sermons of Wesley's, the Minutes, his Notes on the New

Testament, and 24 of the 39 Articles of the Church of England. Those omitted were the 3d, the 8th, the 13th, 15th, 17th, 18th, 20th, 21st, 23d, 26th, 29th, 33d, 35th, 36th, and 37th. In those sent over by Wesley and adopted there are various alterations; some merely in phraseology, others radically changing the meaning. To the 24 articles the Conference added a 25th, recognizing the United States as "a sovereign and independent nation." Wesley also sent over the Sunday Service of the Church of England modified upon the same principles upon which he altered the articles. The systematizing and energizing effects of this settlement were seen at once. The first regular General Conference was held in 1792. During its sessions James O'Kelly, a very popular district elder, fruitlessly endeavored to limit the episcopal power of appointments, by giving dissatisfied preachers the right of appeal. Disappointed he withdrew, and led away several preachers and many members. At the General Conference of 1804, the power of the bishops in making appointments was limited by a resolution prohibiting the appointment of pastors for more than two consecutive years in any one circuit or station. Theoretically all traveling ministers who had served for four calendar years were members of the General Conference; but in practice few came from distant points. Hence unendurable dissatisfaction arose because of the preponderating number and denominating votes of those living near the seat of the Conference. Representative government was introduced by the General Conference of 1808, which provided for a delegated General Conference to assemble on the first day of May 1812. It was composed of one delegate for each five members, two thirds of all the representatives were requisite to make a quorum, and if present one of the general superintendents must preside; otherwise the Conference had power to elect a president, pro tempore. To the Conference thus constituted was given "full power to make rules and regulations" for the Church, subject to the following exceptions: It cannot touch, "revoke, alter or change" the doctrinal standards, nor change the ratio of representation; nor "do away with Episcopacy or destroy the plan of our Itinerant General Superintendency"; nor modify the general rules, nor "do away" with the rights of ministers and members to trial and appeal; nor devote the profits of the Book Concern or the dividends from the Chartered Fund to any other cause than to the support of the ministry, their wives, widows and orphans. The constitution provided for its alteration by separate but concurring votes of the Annual Conferences and two thirds of the members of the General Conference.

Previous to the General Conference of 1812, the body known by that name was absolute. Under the new constitution the first great struggle was for recognition of the laity in the government of the church. With this was connected criticisms of the Episcopacy and its powers. In the end a large number of the lay, and some of the clerical, leaders of the movement were expelled, and they, with others who voluntarily withdrew, formed the Methodist Protestant Church in 1830.

A formidable attempt — supported by many of the most influential men of the denomination — was made to take away from the bishops the right of appointing the Presiding Elders of the districts into which for executive purposes the Annual Conferences are divided. This struggle agitated the church for 10 years and was hotly contested in two General Conferences. A modification of the plan prevailed in the General Conference by a small majority. The Senior Bishop, McKendree, pronounced it unconstitutional, and agitated the Annual Conferences almost to the verge of disruption. In the end the project was defeated. It reappeared at intervals, making its final effort in 1876, when it was overwhelmingly rejected. A controversy more agitating, persistent and disastrous grew out of the slavery question. During the entire history of American Methodism it had been a burning question, becoming more and more acute at each successive General Conference. The real crisis of the Methodist Episcopal Church occurred in 1844. Bishop James O. Andrew, a native of the South and a man of unbounded personal popularity, became, through marriage, complicated with slavery. The anti-slavery sentiment of the North and parts of the West would not brook this in a bishop, and in the General Conference of 1844 there were introduced resolutions of protest and censure, expressed or implied, of different degrees of strength and offensiveness to the Southern members in the General Conference. During the discussion radically divergent views of the Constitutional rights of bishops came into view. After a debate which attracted the attention of the whole country, the following was passed:

"That it is the sense of this General Conference that he (Bishop Andrew) desist from the exercise of this office (that of general superintendent) so long as this impediment (his connection with slavery) remains."

Nearly all the votes for the resolution were from the free, and nearly all against it were from the slave-holding, States. The result was that the Southern Conferences established a distinct religious Communion under the name of the "Methodist Episcopal Church, South" (q.v.). (The two denominations have long been on increasingly friendly terms, and are now through commissions engaged in perfecting a hymnal and an order of service to be used in common.)

In 1866 the sense of the Church was taken on the question of Lay Representation, and the decision was in the negative, both lay and clerical. In 1868 and during the four years following, the same proposition was tried again, and the constitution was amended so as to admit a restricted number of laymen into the General Conference of 1872; after several unsuccessful attempts, the number of lay and clerical delegates was constitutionally made equal, the change taking effect in the General Conference of 1900. In 1887-8 five women were elected lay delegates to the ensuing General Conference. Their eligibility was challenged on the ground that the constitution contemplated male members only. The challenge was sustained and a change in the constitution submitted to the Conferences. It did not prevail; subsequent Conferences were agitated upon the subject, women were seated and challenged, the question was not brought to an issue, and two more attempts to change the constitution so as to render them unquestionably eligible were unsuccessful. In 1900, the constitution as a whole was revised; the word "laymen" removed from the law and its place filled with the phrase "lay members," which now makes members otherwise qualified and duly elected eligible to seats in the General Conference without distinction of sex. In 1864 the time limit upon the appointment of pastors was lengthened to three years; in 1885 to five years; and in 1900 it was entirely removed.

The Church is divided into 124 Annual Conferences, 18 of which are in foreign countries. Beside these are 19 Mission Conferences, of which 7 are foreign. The Bishops preside in these Conferences. In its 120 years of organization it has had 46 Bishops, of whom 16 are living. There are also 3 Missionary Bishops, 2 in India and 1 in Africa.

The oldest important subordinate organization of the Church is the Methodist Book Concern, founded in 1789. Originally designed to print and publish Methodist and general religious literature, its profits, if any should accrue, to be devoted to the support of the ministry, its function has been greatly enlarged till its capital in the Eastern and Western Houses approximates $3,000,000. This institution publishes a series of denominational weekly journals whose generic name is 'Christian Advocate,' the oldest of which is 'The Christian Advocate' in New York. It also publishes the 'Methodist Review' (bi-monthly) and 'The Epworth Herald' (weekly). It issues periodicals in various languages, books upon all subjects, and in fact does a general book business. There are also papers published in the interest of the churches by local associations, the best known of which are 'Zion's Herald' of Boston, Mass., and the 'Michigan Christian Advocate' of Detroit.

Next to the Book Concern in age is the Missionary Society. Since this institution was founded, 80 years ago, it has disbursed upward of $35,000,000, rather more than two fifths of which has been spent in this country, the rest in foreign countries. Its missions are in Africa, China, India, Japan, Korea, Malaysia (including the Philippines), South America, Mexico, Germany, Sweden, Norway, Denmark, Finland, Switzerland, Italy and Bulgaria. Besides the "parent" Society are the Woman's Foreign Missionary Society, which collected and expended in 1902 $478,236, and the Woman's Home Missionary Society, which in 1902 received and disbursed $341,243. The Church Extension Society in the last 40 years has aided 12,356 churches. It distributes in donations $200,000 per annum, and has a loan fund, the working value of which amounts to nearly $3,000,000.

The educational work of the Church in this country includes 52 Colleges, Theological Seminaries and Universities, besides a large number of Academies. Of these the first organized is Wesleyan University, and the largest (in property and students) are the Northwestern University, of Evanston-Chicago, the Ohio Wesleyan University at Delaware, Ohio, and in the East, Boston University and Syracuse University. The Woman's College of Baltimore marks the highest point reached by the Church in the education of women. The American University in Washington is not yet opened. The Church sustains a board of education which aids students by loans and gifts, besides performing other important functions. The Freedman's Aid and Southern Education Society sustains 40 institutions in the South, and with them more than 200,000 students have been connected. Increasing attention is paid to industrial education. The latest enterprises of the Church are the Epworth League (the denominational young people's society), with nearly 1,800,000 members, and the incorporation of Deaconesses with church work. This movement, though of quite recent origin, employes 685 Deaconesses, 739 Probationers, and has accummulated net assets of over $2,000,000. It has been less than 20 years since the attention of the Church was drawn toward the erection and management of hospitals; already it has 25 in operation and several more in process of erection. Of these the Methodist Episcopal (Seney) Hospital of Brooklyn, and the Methodist Episcopal (Stewart) Hospital of Philadelphia are the largest and oldest.

No tax of any kind is levied upon individual members of the Church; their contributions are voluntary; no charge is made for the administration of baptism or the burial of the dead. Yet it is a conservative estimate that in the three years preceding the present the Church has given $100,000,000 to its work. And during the past 20 years, for the current support of local churches, the support and endowment of denominational schools, colleges and theological seminaries, the regular collections and special gifts for missions and the other organizations previously mentioned, The American Bible Society, Homes for the Aged, Hospitals, Orphan Asylums, Saint Christopher's Home and similar institutions, including the recent $20,000,000 thank offerings (but not duplicating the same, nor including much untabulated gifts in local churches), the denomination has given upward of $410,000,000. The number of communicants reported in 1882 was 1,748,021; in 1910 3,159,913.

The African Methodist Episcopal Church was organized in 1816 and in 1910 reported 452,126 members (estimated). The African Methodist Episcopal Zion Church was formally organized in 1820 and in 1910 reported 545,681 members. These bodies were founded by members of the Methodist Episcopal Church. The Colored Methodist Episcopal Church was formed of members of the Methodist Episcopal Church, South, set apart after the Civil War. After 1865 the Methodist Episcopal Church spread rapidly among the Southern negroes, and it enrolls among its members more than 200,000 of African descent. The Wesleyan Methodist Connection of America was formed in 1843 by ministers and members of the Methodist Episcopal Church who regarded the mother church as not sufficiently anti-slavery, and also disapproved some features of its government. Beginning with 6,000 members it reported in 1910 19,485 members. The Free Methodists date from 1860. It grew out of the disciplining of certain members and ministers for contumacy. The root difficulty related to "secret societies" and certain doctrines and experiences which they advocated so as to create dissension in the churches. They claimed to be persecuted "for righteousness sake." In 1910 they reported 32,166 members.

James M. Buckley,
Editor 'The Christian Advocate.'

Methodist New Connection. See NEW CONNECTION METHODISTS.

Methodius, mĕ-thō'dĭ-ŭs. See CYRILLUS AND METHODIUS.

Methuen, mĕ-thū'ĕn, **Paul Sanford,** BARON, English general: b. Corsham Court, Wiltshire, 1 Sept. 1845. He is descended from Sir Paul Methuen who effected the treaty, named after him, between England and Portugal in 1703. He studied at Eton; entered the Scots Guards in 1864; saw special service on the Gold Coast in 1873; received a medal for bravery in the Ashanti campaign in 1874; became attaché in Berlin (1877), assistant quartermaster-general Home District (1881), and quartermaster-general in Egyptian War (1882); won a C. M. G. in Bechuanaland (1885); was in command of the Home District from 1892 to 1897; and commanded one of Buller's divisions in the unsuccessful attempt at the beginning of the South African war to relieve Kimberley. At Magersfontein he was terribly beaten. With Lord Roberts he marched on Pretoria in May 1901. In March 1902 he was captured between Vryburg and Lichtenburg, but immediately released. His South African record formed a strange contrast to his early military career.

Methuen, Mass., town, in Essex County; on the Spicket River, and on the Boston & Maine Railroad; about two miles north of Lawrence. It was settled in 1641 but was a part of Haverhill until 1725 when it became the town of Methuen. The government is administered, as in its early days, by town meetings. It has a number of manufacturing establishments, chief of which are cotton and woolen factories, bell foundry, organ factory, knitting mills, hat factory, worsted goods and yarn factories, and basket factories. It has good schools and the Nevins Memorial Library. Pop. (1890) 4,814; (1900) 7,512; (1910) 11,448.

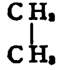
Methuen Treaty, a commercial treaty between Great Britain and Portugal signed in 1703 and annulled in 1835, having to do with the tariff on wines and wool. It was negotiated by Paul Methuen, the British ambassador to Portugal.

Methuselah, mĕ-thū'sĕ-la (“man with a dart?”), Hebrew patriarch. He is remarkable as the oldest man mentioned in the Bible, his age being stated in Gen. v. 27 as 969 years. According to Hebrew chronology, and to that of the Samaritan version (which, however, reduces his age to 720 years), he died in the year of the Flood; but the Septuagint calculation makes him die six years earlier.

Meth'yl and its Derivatives, in chemistry; this name is given to the hypothetical radical CH_3, supposed to exist in methylic alcohol, and in very many other carbon compounds. Methyl forms the first of the series of alcohol radicals, the general formula of which is C_nH_{2n+1}. In the year 1848 Frankland and Kolbe, by the action of potassium on ethyl cyanide, obtained a gas the composition of which agreed with the formula C_2H_6; now such a body may be regarded either as (1) ethyl hydride $C_2H_5.H$, or (2) as two atoms of methyl linked together to form one molecule.

$$\begin{array}{c}CH_3\\|\\CH_3\end{array}$$

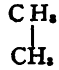
For a considerable time the new substance was supposed to be free methyl, that is —



$$\begin{array}{c}CH_3\\|\\CH_3\end{array}$$

and to be isomeric, but not identical with ethyl hydride $C_2H_5.H$.

According to the generally received views concerning atomicity (see CHEMISTRY) such a body as CH_3 could not exist in the free state; it was therefore in keeping with chemical theory to believe that in the moment of its liberation the atoms of this substance should combine together in pairs to form the stable molecule —



$$\begin{array}{c}CH_3\\|\\CH_3\end{array}$$

A few years later Frankland succeeded in preparing the same body by the action of zinc on methyl iodide, $Zn+2CH_2I=ZnI_2+2CH_3$. Frankland compared the action of chlorine on this supposed $2\,CH_3$ with the action of the same gas on the so-called ethyl hydride ($C_2H_5.H$), and concluded that the two bodies were not identical. Schorlemmer has, however, studied this action of chlorine more carefully, and he finds that the resultant substances are the same in each case. The reactions which take place between equal volumes of chlorine and of the gas C_2H_6 may be thus formulated:

(1) $C_2H_6 + Cl_2 = C_2H_5Cl + H\,Cl$.
(2) $C_2H_5Cl + Cl_2 = C_2H_4Cl_2 + H\,Cl$.

The first reaction is the principal one; small quantities of the body $C_2H_4Cl_2$ (dichloro-ethane) are, however, always formed. The identity of the two substances formerly known as free methyl and ethyl hydride has been thus proved, so that we now know only of one body having the formula C_2H_6, to this substance the name of ethane is given, it forms the second hydrocarbon in the marsh-gas, or C_nH_{2n+2} series. From these considerations it is evident that the radical methyl is only known in combination with other bodies. By the action of chlorine on certain methyl compounds the body CH_3Cl is obtained, from which again the bodies CH_2Cl_2, $CHCl_3$, and CCl_4 may be produced. The oxide of methyl $(CH_3)_2O$, or methylic ether, is produced by the action of sulphuric acid upon wood spirit; this ether may be taken as typical of a large series, in which one of the groups CH_3 is replaced by another radical (either alcoholic or acid). The hydroxyl derivative of methyl, or methylic alcohol, CH_3OH, is prepared in many ways. The most generally employed method consists in rectifying the product obtained by the dry distillation of wood (hence the common name for this alcohol — wood spirit); but in order to obtain perfectly pure methylic alcohol it is necessary to prepare a methylic ether, generally methyl oxalic ether, decompose this by distillation with water, and dehydrate the alcohol so obtained by means of quicklime. Methylic alcohol is a colorless mobile liquid, having a specific gravity of .8142 at 0°; its boiling point lies about 60° C. The presence of a certain amount of methylic alcohol in ordinary or ethylic alcohol does not interfere with the use of the latter substance in many chemical operations. Such a mixture is known in commerce under the name of ***methylated spirit.*** Methylic alcohol yields by oxidation formic acid (CH_2O_2), thus $CH_4O + O_2 = CH_2O_2 + H_2O$.

Another important series of methyl derivatives consists of substances known as *methylamines;* these are generally regarded as ammonia in which one, two, or three hydrogen atoms are replaced by one, two, or three atoms of the radicle CH_3. Thus we know of the substances $NH_2.CH_3$, $NH(CH_3)_2$, and $N(CH_3)_3$. Further, as we know of such bodies as ammonium iodide and chloride, so we are acquainted with the corresponding methyl-ammonium salts $N(CH_3)_4I$, etc. The group CH_3 may also be introduced into many of the natural alkaloids (see STRYCHNINE), giving rise to methyl derivatives of these bases.

Methyl Alcohol. See ALCOHOL, and METHYL.

Meth'ylated Spirit, alcohol or spirit of wine containing 10 per cent of wood naphtha, which contains a large proportion of methylic alcohol (see METHYL). It is much used in the arts as a solvent, for preserving specimens, in the manufacture of varnishes, and for burning in spirit and other lamps.

Meth'ylene, Bichloride of, an organic compound of great value as an anæsthetic. It is a colorless fluid having an odor like that of chloroform, and is pleasant to inhale.

Methylene Blue, an aniline dye; a bluish crystalline powder having a bronze-like lustre. It is used in medicine, and in malaria is given as a substitute for quinine. See DYES.

Metis, mē'tĭs, in ancient mythology, the first wife of Jupiter, whom he was said to have devoured, after which Minerva (q.v.) was formed within his head.

Metlahkatla, mĕt-lä-kä'tlä, or **Metlahkatlah,** the native name of the oldest and most successful mission among the Indians of British Columbia, founded in 1857, by William Duncan, an English missionary, who developed a model community from a tribe of the lowest cannibals. In 1887, having by petition to the United States government received the grant in perpetuity of Annette Island, Alaska, the community removed to that place, where it became very prosperous under the name of New Metlahkatla. In 1898, a bill infringing on the rights of these settlers was introduced in Congress by prospectors wishing to exploit the mineral resources of the island; but the measure was defeated.

Meton, mē'tŏn, or **Meto,** Athenian mathematician who flourished 432 B.C. In the first year of the 87th Olympiad he observed the solstice at Athens, and in conjunction with Euctemon published his cycle of 19 years known as the Metonic cycle (q.v.).

Meton'ic Cycle, a period of 19 solar years, after which the new and full moon fall on the same days of the year as they did 19 years before. This cycle was the invention of Meton, a celebrated Athenian mathematician, 432 B.C. The Metonic cycle contained 6,940 days, which exceeds the true length of 19 solar years by 9½ hours nearly. On the other hand, it exceeds the length of 235 lunations, or synodic revolutions of the moon, by 7½ hours only. In the ecclesiastical calendar the number of the year in the cycle is called the golden number. The cycle is supposed to commence with the year in which the new moon falls on the 1st of January.

Metope, mĕt'ō-pē (Greek, *meta,* between and *opē,* a hole), in architecture, the interval or square space between the triglyphs in the Doric frieze. The ancients were in the habit of ornamenting these parts with carved works, or with paintings.

Metre, mē'tėr, the unit of length in France, =39.37079 English inches. The metre was intended to be the ten-millionth part of the quadrant of a meridian of the earth. The *centimetre,* the one-hundredth part of a metre, possesses more advantages in physics as a unit of length; it is also found very convenient for many purposes for which the English yard is employed. See WEIGHTS AND MEASURES.

In music, the equalization of time in the division of a composition. The measure (q.v.) is the smallest element in metre; two measures make a *section,* two sections make a *phrase,* and two phrases make a *period.* See MUSIC.

In poetry, a name applied to measured or rhythmic verse; where versification depends not only on the number of feet in a line, but also on the length of the syllable or syllables in each foot. See POETRY.

Metric System, The International. In early times each locality and industry had its own system of weights and measures which crudely served local needs and primitive conditions. With increasing intercourse between communities, this diversity of units and standards proved confusing and intolerable, and the demand for a simple universal system grew steadily to a climax in the closing years of the 18th century. The metric system of weights and measures was the fruit of decades of research, agitation, and indefatigable labor toward this end.

As early as 1670, Abbé Gabriel Mouton proposed as the unit for length an arc of one minute of the earth's circumference. Decimal subdivisions and multiples of this unit and an excellent Latin terminology were also suggested. Fifty years later, J. Cassini again suggested this unit. Christopher Wren, the English architect of Saint Paul's, urged as a unit the length of a pendulum beating half seconds. The length of a seconds-beating pendulum was proposed successively by Picard (1671), Huygens (1673), La Condamine (1747), and by Prieur, Miller, Jefferson, and Talleyrand in 1790. About 1783 James Watt, the inventor of the steam-engine, proposed a new decimal system with a simple inter-relation between the units of length, area, volume, and weight, a definite volume of water being taken as the unit of mass. In 1782, Gouverneur Morris, of Philadelphia, urged the use of the decimal ratio in the new monetary system. This was adopted and undoubtedly impressed the French with the great convenience of using the same universal system in daily trade which is used to express all abstract values. Influenced by the report of Morris, Thomas Jefferson, then secretary of state, on 20 May 1790 published a report outlining a decimal system of weights and measures.

Before the French National Assembly took the action in 1790 which culminated in the establishments of the metric system, the important elements and principles of a universal system of weights and measures had already been formulated: (1) The Arabic numerals with their decimal notation, already in use throughout Europe long before Roman numerals were discarded in English accounting; (2) the decimal ratio, whose origin antedates history, applied by the United States to its coinage upon recommendation of Gouverneur Morris; (3) a natural base for the unit of length urged by Christopher Wren: (4) an aliquot part of the earth's circumference suggested by Mouton; (5) a precise and scientific terminology formulated by the same illustrious Abbé; (6) a direct and simple inter-relation between the units of dimension and mass urged by James Watt; and finally (7) international co-operation suggested by La Condamine about the middle of the 18th century.

In 1790, new systems of weights and measures were introduced independently in the House of Commons of England by John Miller, in the House of Representatives of the United States by Thomas Jefferson, and in the National Assembly of France by Prieur and Talleyrand. The noteworthy project of Prieur du Vernois was presented to the French Assembly 9 Feb. 1790. The following month Talleyrand published a proposition concerning weights and measures which was later presented to the Assembly, referred to the Committee on Agriculture and Commerce, and considered by the Assembly 8 May. A decree sanctioned by Louis XVI. on 22 Aug. 1790, approved the establishment of a new system, invited other nations to join in fixing the unit, and referred the whole subject to the French Academy for action. Representatives of Spain, Italy, Denmark, Netherlands, Switzerland and France actually participated in the consideration of the project. The Academy Commission, consisting of Borda, Lagrange, Laplace, Monge, and Condorcet, made a full report 19 March 1791, which resulted in the decree of 26 March 1791, sanctioning the choice of the earth's quadrant as the basis of the new system, the use of the decimal ratio, and a simple inter-relation between the units of dimension and mass. An arc of 10° on the meridian of Paris was measured with the utmost precision to deduce the length of the metre. The survey was successfully completed by Delambre and Mechain in spite of extreme technical and political obstacles. Meantime, Lavoisier and Haüy, assisted by LeFevre-Gineau and Fabbroni, determined with the utmost care the weight of a definite volume of water as a basis for the new unit of mass. The nomenclature of the new system, based upon a report by the Academy, 19 Jan. 1793, was fixed by law 7 April 1795, after 18 months of discussion.

In 1799, an international commission composed of representatives of ten independent nations was convened in Paris to deduce and establish the precise length of the proposed metre. The adoption of the report of this Commission by the Legislature 22 June 1799, marked the real birth of the metric system. Platinum standards of the metre and kilogram were adopted and formally deposited in the Palais des Archives at Paris. Copies of the standards were deposited at the Conservatoire des Arts et Métiers, the Observatory of Paris, and others were presented to several countries including the United States. Thus was established the metric system which within a century became the legal system of more than two thirds of the civilized world. Founded upon the simplest principles and the fundamental modes of thought, the system presented such admirable features that it rapidly grew in favor among the intelligent classes in all countries. By the close of the 19th century more than 40 countries had adopted the system, and in scientific work its use had become world-wide.

The metric system was from its inception distinctly an international system, but in order that it should attain its fullest success, it was imperative that provision be made for international standards and their proper preservation as well as for national standards and their regular re-comparison with the fundamental standards of the system. This step was taken at the next international conference. As far back as 1821, John Quincy Adams in his classic report on Weights and Measures made to the Senate 22 February of that year, had urged an international conference and an agreement among nations to consider the metric system "conceived and thus far executed by France and to co-operate with her to the final and universal adoption of her system." This suggestion was not carried out until 1870. During the half century following Adams' report, international intercourse increased by leaps and bounds, the metric system spread from continent to continent, while science and industry experienced a growth unprecedented in the world's history, all of which accentuated the need of accurate and uniform standards. Inspired by these great movements and the growing demands for precision and uniformity everywhere, the emperor of France, Napoleon III. by decree of 1 Sept. 1869, called an international conference to arrange among other things for the construction of new metric standards to meet the most rigorous demands of modern metrology. Twenty-four nations appointed delegates and the first session opened at Paris 8 Aug. 1870. Five meetings were held and important preliminary work inaugurated, but the session was unfortunately cut short by the Franco-Prussian war. At the second session which was convened 24 Sept. 1872, thirty nations were represented and remained in session until 12 October.

After careful consideration, the Commission passed forty resolutions to govern the construction of the new standards; 21 of these propositions referred to the metre, 12 to the kilogram, and two refer to their preservation and the guarantee of their invariability. The necessary scientific investigations were made by eleven special committees of savants. It was decided that all the standards should be constructed of an alloy of ninety per cent platinum with ten per cent iridium, and a tolerance of two per cent in excess or deficiency (resolution No. 6). This refractory alloy possesses extreme hardness, a fine grain, and withstands chemical action to a remarkable degree. The iridium-platinum alloy was adopted upon the suggestion of Henri Sainte Claire-Deville, who with his brother Charles and the physicist Stas of Belgium devoted the ensuing 10 years to attaining the requisite purity of the constituent materials; in their investigations opening up new chapters in the chemistry of the refractory alloys. The first ingot weighing 525 pounds known as the "alloy of 1874" failed to meet the high standard of purity set by the Commission. Several standards, however, were constructed, one of which is deposited at Washington. A new alloy was prepared in the most careful manner by Messrs. Johnson, Matthey & Company, of London, and after repeated meltings the required homogeneity was attained. The purity was tested by the chemists of the International Committee and of the French section and was found to exceed the requirements in this respect. Thirty-one prototype metres were made from this casting, and the copy corresponding to the true length of the metre of the Archives was selected as the international standard of length and is designated by the letter 𝕸. The International Prototype Metre is an iridio-platinum bar 102 centimetres in length of a cross section, 20 millimetres square, intermediate between the capitals H and X, and of such form that the surface bearing the graduations lies in the neutral plane of the bar. The lines used to define the metre were traced at the Conservatoire des Arts et Métiers. There are three lines engraved near each end of the bar. They are 6 to 8 microns wide and about a half millimetre apart, and the metre is defined as the distance between the middle lines of each group when the temperature of the bar is at 0° Centigrade. Thirty-nine prototype kilograms were constructed, the one most nearly corresponding to the kilogram of the Archives being selected as the international standard of mass and designated by the letter 𝕶. On 26 Sept. 1889, the International prototypes were unanimously approved, adopted, and formally deposited in a special vault at the International Bureau of Weights and Measures, fastened by three locks, the keys of which were delivered, respectively, to the Custodian of the Archives of France, the President of the International Committee, and the Director of the Bureau. The vault in which the prototypes are preserved is opened not oftener than once a year, these three officers being present.

The national prototypes of the metre and kilogram, furnished to the States signatory of the convention of the metre, were of the same material, form, and perfect construction as the international standards themselves. Each contributory country received two copies of each international standard, to be used as a working standard and a reference standard, respectively. The standards were accompanied by attested certificates of comparison, two hard glass thermometers, each with a table of corrections referring to the international hydrogen scale, a piece of the alloy cut from the end of the metre bar for testing the coefficient of expansion, and each kilogram was accompanied by a rock crystal bed plate and other accessories requisite to the safe conveyance of the standard. Metre prototypes numbered 21 and 27 were allotted to the United States, having corrections at 0° Centigrade of +2.5 microns and —1.6 microns, respectively, the probable error of the determination, based upon 784 individual comparisons, being below 0.2 microns. The kilogram prototypes allotted to the United States are numbered 4 and 20, with corrections of —0.075 and —0.039 milligrams, and volumes of 46.418 and 46.402 millilitres, respectively. These copies display a noteworthy precision of adjustment. The probable error of the determinations, based upon 1092 individual weighings, is less than 0.002 milligrams. The copies of the metric standards sent to the United States were received by the President at the Executive Mansion 2 Jan. 1890, the seals broken in his presence, and a certificate authenticating the standards was signed by President Harrison. The standards were at once deposited in the Office of Standard Weights and Measures and are now in the custody of the United States Bureau of Standards, which was established 1 July 1901, by act of 3 March 1901.

The International Bureau of Weights and Measures was established by the Metric Convention of 20 May 1875, signed at Paris by the plenipotentiaries of most of the civilized nations of the world, the United States being the first to sign. This Bureau has the custody of the international standards of the metric system, to which all prototypes of the world are referred for verification, in terms of which the units of all systems are now stated. The Bureau is maintained jointly by the contracting states. The International Bureau is located at Sevres, a suburb of Paris, on neutral territory ceded by France for this purpose. The work of the Bureau is supervised by an International Committee of Weights and Measures which is itself under the control of a general conference for weights and measures, composed of delegates of all the contracting governments. This conference meets at least once every six years to discuss and initiate measures necessary for the dissemination and improvement of the metric system, and to pass upon new fundamental metrological determinations.

THE METRIC SYSTEM.

The fundamental unit of the metric system is the "METRE," which is the unit of length. From this unit the units of mass (gram), and capacity (litre), were derived. All other units are the decimal subdivisions or multiples of these. Furthermore these three units are simply related so that for practical purposes one cubic decimetre of water weighs one kilogram and contains one litre. The metric terms are formed by combining the words "metre," "gram," and "litre" with the six numerical prefixes.

Prefixes	Meaning	Units
milli-	= one thousandth or .001	
centi-	= one hundredth or .01	"metre" for length.
deci-	= one tenth or .1	
unit	= one 1.	"gram" for weight.
deka-	= ten 10.	
hecto-	= one hundred 100.	"litre" for capacity.
kilo-	= one thousand 1000.	

The following tables are formed by inserting successively the names of the three units in the column headed "unit" in the above outline table:

LENGTHS.

Ten milli-metres = One centi-metre.
" centi-metres = " deci-metre.
" deci-metres = " metre (about 40 inches).
" metres = " deka-metre.
" deka-metres = " hecto-metre.
" hecto-metres = " kilo-metre (about ⅝ mile).

The square and cubic units are the squares and cubes of the linear units.

WEIGHTS.

Ten milli-grams = One centi-gram.
" centi-grams = " deci-gram.
" deci-grams = " gram (about 15 grains).
" grams = " deka-gram.
" deka-grams = " hecto-gram.
" hecto-grams = " kilo-gram (about 2 pounds).

VOLUMES.

Ten milli-litres = One centi-litre.
" centi-litres = " deci-litre.
" deci-litres = " litre (about 1 quart).
" litres = " deka-litre.
" deka-litres = " hecto-litre (about a barrel).
" hecto-litres = " kilo-litre.

The ordinary unit of land area is the HECTARE (100 metres square), and is equal to 100 Ares. The hectare is about 2½ acres.

The metric ton is 1000 kilograms.

The United States has already adopted the metric system for many purposes. In 1866, Congress legalized it for all purposes (Revised Statutes, sec. 3569); all the States have been provided with copies of the metric standards (Joint Resolution of Congress, approved 27 July 1866); foreign postal rates are fixed in metric units (Revised Statutes, sec. 3880); the subsidiary silver coinage is based on specified metric weights (Revised Statutes, sec. 3513); and in August, 1894, Congress adopted the international electrical units based on the metric system as «the legal units of electrical measures in the United States.» (Revised Statutes, Sup. Vol. II., ch. 131). By proclamation of 1899, the metric system was made obligatory in Porto Rico, and by Act of 1901 was made the legal system of weights and measures in the Philippines. The most important actions, however, were the establishment in 1875 of the International Bureau of Weights and Measures by the United States and other leading countries of the world (United States Statutes at Large, Vol. XX., page 107), and the adoption of the metre and kilogram as the fundamental standards of the United States, from which the yard and pound are to be derived, 5 April 1893.

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Met'ronome, in music, an instrument consisting of a weighted pendulum moving on a pivot and set in motion by clock-work. It was invented about 1814, for the purpose of determining, by its vibrations, the quickness or slowness with which musical compositions are to be executed, so as to mark the time exactly.

Metrop'olis City, Ill., city, county-seat of Massac County; on the Ohio River, and on the Illinois Central Railroad; about 190 miles south by east of Springfield. The place was settled in 1700 by the French, and a Fort Massac was erected; but no permanent settlement was made until 1838. It was incorporated in 1843. The city has lumber mills, basket and box factories, flour mills, potteries, veneer and furniture factories. The city is the trade centre for nearly all of Massac County. It is a healthy locality, built on a high bluff, with an incline toward the river. There are good schools, the R. W. McCartney Public Library, the Odd Fellows' Temple, a sanatorium, a city hall, court-house, music-hall, and several fine churches. Pop. (1910), 4,655.

Metropolitan, Greek name of an archbishop, whose see is the chief place or metropolis of a province. The metropolitan is above the bishop, but below the patriarch. The title of patriarch, however, is in use only in the Eastern churches. In Russia the metropolitan is at the head of the hierarchy. In the Roman Catholic Church an archbishop may bear this title even though he does not have a metropolis as a see, thus the archbishop of Westminster is styled metropolitan.

Metropolitan Museum of Art. See ART, METROPOLITAN MUSEUM OF.

Metsu, mĕt'sü, or **Metzu,** mĕt'zü, **Gabriel,** Dutch genre painter: b. Leyden 1630; d. Amsterdam 22 Oct. 1667. He studied under his father, Jacques, a Fleming, and under Dou in Leyden; was greatly influenced by Rembrandt, Terburg and Frans Hals; removed to Amsterdam in 1656; and painted some of the best genre pictures of the 17th century. At The Hague may be seen his 'Hunter' and 'Music Lovers'; at the Louvre, 'The Amsterdam Market'; in the Metropolitan Museum, New York, 'The Music Lesson'; and many others throughout Europe's great galleries.

Metternich, mĕt'tĕr-nĭʜ, **Clemens Wenzel Nepomuk Lothar,** PRINCE, Austrian statesman: b. Coblenz 15 May 1773; d. Vienna 11 June 1859. He was educated at Strasburg; when only 17 represented the Westphalian princes at the coronation of Leopold II.; settled in Vienna in 1794; assured himself a place in diplomacy by marrying the daughter of the Austrian chancellor Kaunitz in 1795; and at the Congress of Rastatt again represented the Westphalian collegium. In 1801 he was sent to Dresden by Austria; two years later to Berlin; and in 1806 to Paris. On the outbreak of the war between France and Austria, Metternich was put to much personal inconvenience by Napoleon, who forcibly detained him for some time. Thereafter he entered eagerly into the anti-Napoleonic league; assisted in the formation of the Quadruple Alliance; and as Germany proved successful, took no part in the national sentiment which arose, but directed himself solely to the aggrandizement of Austria, hence doing his best to preserve the French boundaries as they had been and to render Austria the only gainer among the Powers by the reapportionment of Europe. In the years that followed he carried things his own way in Austria, planned the Holy Alliance, and was extremely reactionary in his internal and foreign policies. The revolution of 1830 in France showed the ill-success of his programme; and the rising of 1848 and the insurrection in Vienna itself made it necessary for the emperor Ferdinand to demand his resignation. He kept some power even then, his counsel being frequently sought. Consult: Gross-Hoffinger, 'Fürst Metternich und das österreichische Staatssystem' (1846); Mazade, 'Un chancelier d'Ancien Régime: Le Régne diplomatique de M. de Metternich' (1889); Malleson, Life of Prince Metternich' (1888); Demelitsch, 'Metternich und seine auswärtige Politik' (1898).

Metz, mĕts, Germany, an important fortified city, and episcopal see of Alsace-Lorraine, on the Moselle, which here divides into several arms, 79 miles northwest of Strasbourg. The major part of the town stands on a height within the fortifications, outside of which there is a series of strong detached forts. The cathedral is a late Gothic structure, surmounted by a spire of open work 397 feet high. The manufactures consist of woolens, cottons, hosiery, hats, muslin, glue, leather, etc. Several battles were fought in the neighborhood and under its walls between the Germans and French in August 1870. The Germans subsequently invested the town, and being reduced to a state of famine, on 28 October it capitulated with 180,000 officers and men under the command of Marshal Bazaine. It was included in the cession of territory to Germany at the Peace of 1871, and its fortifications have been greatly strengthened since. (See FRANCO-GERMAN WAR.) Pop. about 60,000.

Meudon, mē-dôn, France, a town south west of Paris, near the Seine, on the railway to Versailles, six miles to the west. It had formerly a fine château, built by Louis XIV., surrounded by the Forêt de Meudon, still a favorite holiday resort of the Parisians. This château was fitted up in 1812 by Napoleon I. for Marie Louise, and it was a residence of the Napoleons under the Second Empire, but was ruined during the siege of Paris in 1870. An astronomical observatory has since been established in the remains of the castle. Meudon has glass-works, bleach-fields, extensive government munition works, and other industrial establishments. Rabelais was for a short time curé of Meudon.

Meulen, mė'lĕn, **Adam Frans van der,** Flemish painter: b. Brussels 11 Jan. 1632; d. Paris 15 Oct. 1690. He studied under Snayers; removed to Paris; and there became court painter to Louis XIV., for whom he painted many battle scenes, of which 23 are now in the Louvre. Many were painted on the spot during action, and all excel by the skill with which horses are drawn and by painstaking detail.

Meunier, mē-nē-ā, **Constantin,** Belgian artist: b. Brussels 1831. He is known as a historical and genre painter as well as a sculptor of considerable power, though his naturalistic pictures are sometimes revolting; and it would seem as if his studies in Madrid had brought him under the influence of Ribera and his sanguinary school. He has produced some vivid pictures of life in the colliery district amid whose unlovely surroundings he has made his home. His 'Martyrdom of Saint Stephen' in the Ghent Museum, is quite in the spirit of Ribera and shocks the mind by its brutal literalness. 'The Peasants' Rebellion' is an example of his energy and force as a realist in modern life. His statue 'The Lost Son' is in the Berlin National Gallery.

Meurice, Francois Paul, frän-swä pōl mė-rēs, French dramatist: b. Paris 1820; d. there 11 Dec. 1905. He was educated at the Collège Charlemagne and entered upon a literary career. He worked for a time in collaboration with Dumas, with whom he made a translation of Hamlet, and was entrusted by Victor Hugo, his brother-in-law, with the publication of his complete works. He published: 'Benvenuto Cellini' (1852); 'Fanfan la Tulipe' (1858); 'Cadio' (1868); 'Césara' (1869); etc.

Meuse, mēz, or mūz, river, which rises in France in the south of the department Haute-Marne, and with a northward trend crosses the northwestern corner of the department Vosges where between Bazeilles and Noncourt it has a subterranean course of three and a half miles. It traverses the departments Meuse and Ardennes, and on reaching Sedan enters Belgium. At Namur where it receives on the left its largest tributary, the Sambre, almost doubling its volume, it changes its course to northeast, and passes Liège, where it is augmented by the Ourthe; it separates Dutch from Belgian Limburg, passing Maestricht and Roermond, at the latter of which it receives the Roer. In the northern part of Dutch Limburg its course is changed to northwest, and subsequently it becomes west. The whole of its after-course is through the Netherlands, in which it forms for some distance the boundary between North Brabant and Gelderland. It finally joins the left bank of the Waal, one of the arms of the Rhine, and gives its name to the accumulated flood of these streams, which, proceeding west through Holland proper, is divided near Dordrecht into two great rivers, the one of which bends round to the north and reaches Rotterdam; the other branch continues west; shortly after the two branches again unite and discharge themselves into the North Sea. The direct length of the Meuse is 230 miles; and its length including windings is 580 miles. It is navigable for about 460 miles.

Mexcala, mās-kä'lä, or **Mescala,** mĕs-kä'lä, a river of Mexico, in the southern part, which has its rise in the mountains southeast of the city of Mexico, and flows generally west to the Pacific. It is called Atoyac in the first part of its course, and on the boundary line between the states of Michoacán and Guerrero, it is called Rio de las Balsas. The port of Zacatula is at its mouth. It is a swift-flowing stream, and has a number of low cascades and rapids.

Mexican Archæology. See MEXICO—ARCHÆOLOGY.

Mexican Hairless Dog, a small terrier-like dog, of uncertain origin, without hair except a tuft on the crown of the head, another on the tail and a few scattering wisps on the body; the skin is grayish black, wrinkled and dry. Clavigero describes a large hairless dog found among the Mexicans by the Spanish conquerors, whose puppies were esteemed as an edible delicacy; and others are recorded as having occurred in ancient Peru and on various of the West Indian islands.

Mexican Jumping Bean. See JUMPING BEAN.

Mexican Literature. See MEXICO—LITERATURE.

Mexican Nun, The, name given to JUANA INEZ DE LA CRUZ, Mexican poet; b. San Miguel de Nepantla, near Mexico, 12 Nov. 1651; d. Mexico 17 April 1695. She was well known in Mexico for her learning, took the veil in the convent of San Jerónimo, after some 27 years abandoned her studies wholly for the duties of the convent, and sold her library in aid of charity. Her death occurred during a severe epidemic. Among her works are: 'Poésias Sagradas y Profanas'; 'El Neptune Alegórico'; and the comedy 'Los Empeños de Una Casa.'

Mexican Subregion, a faunal district of the Neotropical region embracing the low hot coast region of Mexico. See ZOÖGEOGRAPHY.

Mexican Tea. See GOOSEFOOT.

Mexican War, The. The annexation of Texas in 1845 laid the foundation for the war with Mexico. Although Texas has been for many years practically free, and had been recognized by the United States, England, France and other countries, yet Mexico still refused to acknowledge its independence. When therefore the United States proposed to admit Texas into the Union, Mexico gave warning that the annexation would be equivalent to a declaration of war, and 6 March 1845 protested, and soon afterward withdrew her minister and severed diplomatic relations. Her acts, however, scarcely justified her threats, as at that time at least little or no preparation was made for war. It has therefore been claimed that had the American government used a conciliatory policy peace might have been preserved, and friendly relations re-established.

At the moment, however, the Mexican people and authorities were in a rather belligerent attitude, due in part to pride, and in part to an expectation that the United States would soon be involved in a war with Great Britain over the Oregon boundary, in which case Mexico would have a powerful ally to aid her. Did President Polk at this point seek to strengthen this hope in the minds of the Mexicans, intending at the proper moment to make a compromise and peace with England, as was done, and thus leave Mexico at the mercy of the United States? Perhaps history can never answer the question, but events at least seemed to march in harmony with the thought. For Mexico soon found herself in the dilemma that she must either sell California to the United States, receiving in return a goodly sum of money to appease her pride, or engage in a war to sustain her honor and territorial integrity. Mexico bravely, but perhaps not wisely, chose the latter alternative, not fully realizing the inequality of the contestants, nor the depth of the humiliation to which she would be subjected. Doubtless President Polk preferred to acquire California without war; but its acquisition was to be the principal measure of his administration. Hence if war was the only means to secure it, war it must be; at least enough to get possession of the desired territory, then he would be glad to return to a peace policy.

Causes of the War.— The immediate occasion however, of the war was the dispute in regard to the western boundary of Texas. Proclaiming her independence in 1836 Texas asserted that her western boundary was the Rio Grande to its source, thence due north to the 42d degree of north latitude. The following year the United States recognized her independence, and in December 1845, by a joint resolution, admitted her into the Union as a State, providing that boundary disputes were to be settled by the United States. President Polk accepted the boundary line claimed by Texas, and 13 Jan. 1846 ordered General Zachary Taylor to march to the eastern bank of the Rio Grande as the western boundary of the United States. Mexico insisted that the Nueces River — 100 miles eastward — was the true western boundary of Texas, and therefore that Gen. Taylor was now on Mexican soil. On 25 April 1846, the first blood was shed in a conflict between a band of Mexican troops that had crossed to the eastern side of the Rio Grande and a company of American soldiers. The news of this action was immediately communicated by Gen. Taylor to President Polk, who sent his now noted message to Congress, asserting that war was begun by the act of Mexico on American soil. Congress accepted, after a stormy debate in the Senate, the President's statement, and war was recognized as existing.

Other causes than the two already noted were also at work, and help to make a decision in regard to the justness of the war still more difficult. Mexico for many years had been in a chronic state of revolution. The natural result followed. American citizens in Mexico sustained property losses, and doubtless were frequently unjustly arrested and even imprisoned. Claims arising from these causes had been in part settled under a convention of 1840, but many of them were still pending. Some were just; more, either unjust or extravagant in amount. President Polk united these unsettled claims with the boundary question, and demanded that Mexico receive an envoy extraordinary with power to settle both — on its face an eminently fair proposition. On the other hand, Mexico professed to be ready to receive an ambassador to settle the boundary dispute, but declined to receive Mr. Slidell as our minister when commissioned to settle all disputes, insisting that the two questions were distinct in kind and origin and should not be united. President Polk in his message asserted that this action of Mexico was in violation of her promise to receive a minister, and hence justified his administration in its measures, and forced him to take possession of the disputed territory.

The need of more slave territory was perhaps another factor in causing the war. At least many from the South took an aggressive position on all questions in dispute between the two countries and thus made a peaceable settlement more difficult. Both the economic and the political reasons for more territory began to be felt by 1846 — the one to have new soil over which to spread the land-exhausting system of slavery; and the other to have new territory out of which to carve new slave States that the equilibrium between slave and free States might be maintained. Some other forces tending to arouse the war and aggressive spirit may be noted. The cry of «manifest destiny» played a part. Many, especially in the West, felt that the Pacific Ocean was the natural western boundary of the United States. They also demanded the «Golden Gate» that commerce might be opened up with the Orient. The two great parties — the Whigs and the Democrats — divided quite sharply on the question; in fact so completely that the war became almost a party, instead of a national, war. The Democrats as a rule supported the administration and its claim that the war was just. The Whigs, on the contrary, asserted that it was a most unholy and unrighteous war, and characterized it as Polk's war. Lincoln entering Congress in 1847 became a severe critic of the policy pursued, while Tom Corwin of Ohio went so far as to use this language: «If I were a Mexican I would tell you, 'Have you not room in your own country to bury your dead men? If you come into mine we will greet you with bloody hands, and welcome you to hospitable graves.' »

President Polk summarized his reasons for recommending that Congress recognize war as existing as follows: «The grievous wrongs perpetrated by Mexico upon our citizens throughout a long period of years remain unredressed; and solemn treaties . . . have been disregarded. . . . Our commerce with Mexico has been almost annihilated." He then adds: "As war exists, and . . . exists by the act of Mexico herself, we are called upon by every consideration of duty and patriotism to vindicate with decision the honor, the rights, and the interests of our country."

The Campaigns.— The war with Mexico was accepted as a fact by Congress 13 May 1846. There were four principal fields of action in its prosecution. (1) Along the Rio Grande, under the command of Gen. Zachary Taylor; (2) in California, where Capt. John C. Frémont and Admiral Stockton were in command; (3) in New Mexico, with General Stephen W. Kearney leading the American forces; and (4) from Vera Cruz to the City of Mexico, under the command of General Winfield S. Scott, the commander-in-chief of the American armies. Everywhere success attended the American arms. Perhaps it was the first war in history, lasting two years, in which no defeat was sustained by one party, and no victory won by the other.

Gen. Taylor defeated the Mexican troops at Palo Alto 8 May; at Resaca de la Palma the following day and captured Matamoras on the 18th. He remained near that city for some weeks to recruit his army and prepare to advance into the interior. On 24 September he entered Monterey, after a siege of four days, and a gallant resistance by the Mexicans. Taylor's most famous victory, however, was won 23 Feb. 1847 at Buena Vista. Gen. Scott gave orders, which unfortunately fell into the hands of Santa Anna, the Mexican general, for Gen. Taylor to send some nine regiments to aid Scott in his proposed attack on Vera Cruz. Santa Anna immediately marched his whole command against Taylor, expecting to crush him in this weakened condition. It was 20,000 men against about 5,000. But the skill of Taylor, the persistence of his army, the organization and equipment of the American troops, won a great victory. Taylor became the hero of the hour, and Buena Vista made him an irresistible presidential candidate.

Frémont's course in California has been a subject of keen controversy. As leader of an exploring expedition he was already in northern California, and early in 1846, was recalled to the Sacramento Valley. California was the goal of the political policy of Polk's administration. The means to secure its acquisition were uncertain. It might be gained by war; or by filling the territory with American settlers who in course of time might bring it into the Union as Texas had already been annexed; or it might be effected by securing the good-will of the native Californians who were already jealous of Mexican rule. The latter policy seems to have been the one adopted by the administration. The American consul at Monterey, Mr. Larkin, was developing this policy with a good prospect of success, it is claimed, when Frémont appeared on the scene. He seems to have developed a fourth policy, namely, the establishment of an independent government under the control of the American settlers in the Sacramento Valley. This movement resulted in the "Bear Flag Republic," and virtual civil war between the native Californians and the American settlers. At this moment the Mexican War began and the "Bear Flag" was replaced by the "Stars and Stripes." It has been claimed by some California historians that Frémont's course, had not the Mexican War come at the moment it did, might have lost California to the United States. The native Californians, alienated as they were by his course, might have put themselves under an English protectorate in revenge for the treatment accorded them. Be this as it may, by the end of the year all California was conquered and held by American troops, and Frémont was regarded as the hero who had won the "Golden Gate" by his energy and decision. Santa Fé was captured by Gen. Kearney, and New Mexico secured with almost no loss of life. By the end of the year, therefore, all the territory that the administration desired was in the possession of its armies, but Mexico was still unconquered.

Scott had been chafing in Washington during the summer and fall of 1846 while Taylor was winning his brilliant victories. He asked to go to the front to assume chief command, but the administration retained him at the capital under the plea of needing his advice. As it happened this Democratic war was officered by Whig generals. Scott had already been a Whig candidate for President. The charge was now made that Scott was kept from command for fear that success might make him a more formidable candidate in 1848. Finally, when he was sent to the front in January 1847, the cry was raised that the purpose was to dim the lustre of Taylor's victories, or at least to divide the popular support between the two generals in such a way as to destroy the political prospects of both.

General Scott invested Vera Cruz in March 1847, and by the 27th had captured the fortress which had been thought to be almost impregnable, and was ready to enter the city. On 8 April he started into the interior, and on the 18th captured Cerro Gordo; the 19th, Jalapa, and the 22d Perota. On 15 May he entered the important city of Puebla. Remaining here for some weeks he again advanced, in August, toward the capital, and on the 10th came in sight of the city of the Montezumas. Two important victories were won 20 August — at Contreras and at Churubusco. He captured Molina del Rey 8 September, and five days later the victory of Chapultepec gave him the City of Mexico itself which he entered on the following day with an army of only 6,000 men. The war was practically over, but the victory was so complete that it began to be a question whether there was any government left with sufficient power to negotiate a treaty of peace. An agitation began with friends both in and out of Congress as well as in the cabinet, looking to the annexation of the whole of Mexico. Calhoun on the one hand, Webster and a majority of the Whigs on the other, joined hands to defeat this plan. President Polk was finally forced to make the ultimate decision. N. P. Trist was sent in March 1847 to Mexico to make a treaty of peace. Failing he was ordered in the fall to return to Washington; but disobeying instructions he remained in Mexico, and on 2 Feb. 1848 concluded a treaty of peace in harmony with his original instructions. The administration was in a quandary. To ratify meant to condone the disobedience of Trist. To reject meant a prolongation of the war, and time to perfect the intrigue for the annexation of "All Mexico." President Polk, after some hesitation, decided to send the treaty to the Senate for its consideration. Received 23 February, it was ratified, after some amendments, 10 March, by a vote of 38 to 14. On 30 May ratifications were exchanged and the war was at an end.

The Mexicans had fought bravely, even stubbornly and at times skilfully, yet in every contest even when the odds were greatly in their favor without a single victory for their cause. In part superior leadership and training won for the soldiers of the northern Republic; in part their cooler and more persistent character; but in the main it was not bravery, nor generalship, nor even character that won. It was science and education applied in the equipment of the armies, the guns of the soldiers, the cannon on the ramparts, and the powder in the arsenals which made the one so much more effective than the other that the most daring bravery was no counterpoise.

The Treaty of Peace.—The treaty of Guadaloupe Hidalgo gave to the administration of President Polk the territory that his diary informs us he intended to acquire, California and New Mexico. Mexico in return for the loss of its fairest northern provinces was paid $15,000,000, and released from all claims of all kinds held by citizens of the United States against her, estimated at $3,250,000, which the United States assumed. Boundary lines were drawn, and provision made in regard to other questions at issue between the two countries.

Results.—Usually successfully waged wars redound to the credit of the party in power. In this case, however, the Democratic party, the author and supporter of the war, was defeated by the Whig party, the party of opposition and criticism, in the presidential election of 1848. The Whigs made use of the popularity of a successful general to defeat the party that had made his glory possible. Evidently the American people were ready to accept the fruits of the war, but also ready to punish the party that they believed had wrought in a wrong manner. Again, a large number of young officers destined to renown in later years proved their worth in this war. U. S. Grant and Wm. T. Sherman on the one side; Robt. E. Lee, «Stonewall» Jackson and Jefferson Davis on the other, in the great civil war, foreshadowed, in this Mexican struggle, the greatness that was to be theirs in the «days that tried men's souls» from 1861 to 1865. The acquisition of 522,568 square miles of territory—an empire four times as large as Great Britain, in itself—was the most important immediate as well as remote result. It was important: first, in the issues that its acquisition precipitated. Should it be slave or free territory? Who should determine its institutions? And out of this question grew the larger one, who had the right to control the institutions of the territories in general? To settle the first question David Wilmot, a Democrat of Pennsylvania, proposed the celebrated «Wilmot Proviso» (q.v.) which would exclude slavery forever from all territory acquired from Mexico. Four long years of intense and bitter debate followed. This question and a series of others were settled temporarily in the Compromise of 1850. The second question was answered by the phrase «Non-intervention,» which meant, or soon came to mean, one thing to Douglas and the Northern Democrats, and another to Davis and the South. Three main theories were evolved or defended in answer to the third query. (1) That Congress had the right to control the institutions of the territories and could make them slave or free at its will. (2) The Dickinson-Cass-Douglas doctrine of Popular or «Squatter» sovereignty:—the doctrine that the people of a territory themselves, while yet in a territorial status, determined their own institutions. (3) The radical Southern view that slaves were property, and, as property might be taken into any territory,—the common public domain of the States,—with no constitutional power anywhere to hinder or prevent. It was important secondly in its industrial and political effect on the nation. The United States now had an outlook on the Pacific Ocean comparable to that on the Atlantic. China, Japan and the East were brought within the circle of its influence. Conditions favorable to further expansion were prepared. In addition to the great effect on commerce thus prefigured, that on wealth and industry was not less. The gold, silver, copper and other mineral wealth of the Rocky Mountain region was turned into the pockets of the American people. This vast addition of territory and wealth tended also to emphasize national pride and ambition; to arouse a still more intense belief in «manifest destiny»; to develop a more optimistic tone, and perhaps also to produce a more materialistic spirit.

Consult: Von Holst, 'Constitutional History of United States'; Burgess, 'The Middle Period'; Benton, 'Thirty Years' View'; 'Lives and Times of the Tylers'; Grant, 'Memoirs'; Lowell, 'Bigelow Papers'; Lincoln, 'Works'; Corwin, 'Speeches'; Richardson, 'Messages'; Congressional Globe (1846-8); Schouler, 'History of the United States'; and the separate histories of the war by Ripley (1849), Ladd (1883), and Wilcox (1892).

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